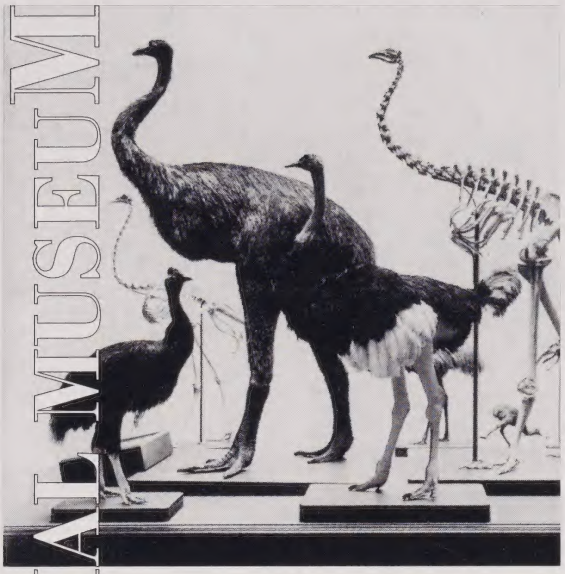
AUCKLAND WAR MEMORIAL MUSEUM



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The Auckland War Memorial Museum has a statutory role to advance and promote cultural and scientific scholarship and research, that is met in part by publication of the *Records of the Auckland Museum* (formerly *Records of the Auckland Institute and Museum*). The *Records* has been published continuously since 1930 and issues now appear annually. Vol. 34 contained indexes to the contents of vols 1–33. Monographs are produced occasionally in the series *Bulletin of the Auckland Museum* (see list of titles at end of this volume).

The *Records* contain the results of original research dealing with material in the collections of Auckland Museum, and research carried out by museum staff members in their particular subjects. All papers are refereed. Instructions for authors are given at the end of this volume. The *Records* are distributed, largely by exchange, to libraries at nearly 300 academic institutions throughout the world. Proposals for exchange agreements should be addressed to the Auckland Museum Librarian.

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RECORDS OF THE AUCKLAND MUSEUM

VOLUME 40

CONTENTS

THE HISTORY AND ARCHAEOLOGY OF QUEEN'S REDOUBT, SOUTH AUCKLAND

NIGEL PRICKETT

Abstract. Archaeological excavations at Queen's Redoubt, Pokeno, in 1992 provide new information on the defences, internal arrangement and material culture of the fortification. The history of Queen's Redoubt is outlined, together with the historic landscape context of contemporary Maori and European sites. As British Army headquarters for the invasion of the Waikato, which led to the Waikato War of 1863–64, Queen's Redoubt was one of the most important fortifications of the New Zealand Wars. The Waikato War was the most significant campaign of the 19th century armed struggle between Maori and Europeans, in terms of the scale of fighting and the outcome for later New Zealand history.

KEYWORDS: New Zealand Wars; fortification; redoubt; 19th century; British Army.

INTRODUCTION

Queen's Redoubt, Pokeno, was the British Army headquarters for the July 1863 invasion of the Waikato. The old fort site is now at the south end of Pokeno, between the Great South Road, which runs through the township, and the Auckland–Hamilton motorway to the east (New Zealand Archaeological Association site record number S12/23 (formerly N46–47/188); 37° 14.80 S, 175° 1.53 E). Figures 1 and 2 give the location of the redoubt, and show it from the air prior to construction of the new motorway in the late 1990s. The north and east sides and most of the interior of the redoubt are on land owned since March 2000 by the Queen's Redoubt Trust. Although largely levelled, the old earthworks can be traced on Trust property before disappearing under houses on the south side of Selby Street.

In February 1992 excavations were carried out at Queen's Redoubt to learn as much as possible about the defences and interior of the fort in two weeks that were available. The work came about as a result of an application to the New Zealand Historic Places Trust by the then owners, Messrs Kerry and Lionel Piggott, for an authority to modify the site. The authority was made subject to an excavation, which the author was asked to direct. The work was paid for by the New Zealand Historic Places Trust.

POKENO AND DISTRICT

Queen's Redoubt was located with regard to strategic considerations, at the southern limit of European settlement south of Auckland, and at the gateway to the Waikato district—still in Maori hands prior to the 1863–64 campaign. The fort was situated in a broad valley, with the

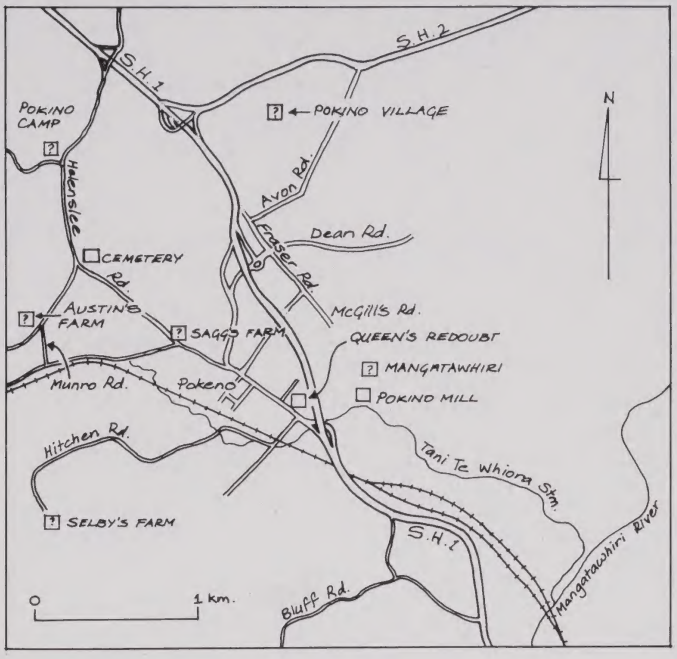


Fig. 1. Historic sites of the late 1850s and early 1860s in the Pokeno district. Question marks show locations not yet confirmed by archaeological evidence.

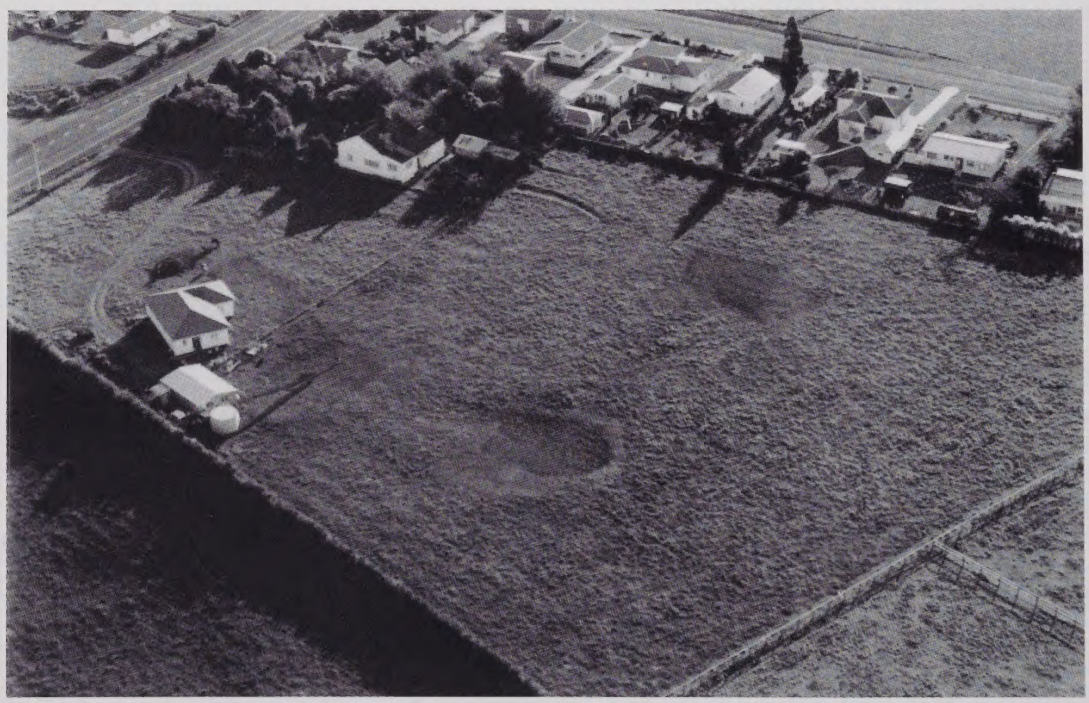


Fig. 2. Aerial view of Queen's Redoubt site from the south–east. Selby Street is at the top, with houses along its near side. At top left is the Great South Road. The photograph dates from just after the 1992 excavations; refilled excavation areas can be seen in the paddock, with the north–east corner of the redoubt (Area IV) visible at the centre of the photograph.

important matter of no nearby higher ground to command the interior. At the time the level valley floor was under grass and fern, allowing easy development of the site. Nearby spurs were under bracken and tutu. To the north and north-east was higher ground, where rich volcanic soil was under cultivation by Ngati Tamaoho people before the war. Hill country further north was covered in dense forest, through which the troops constructed an extension of the Great South Road in the first half of 1862. When Queen's Redoubt was established in winter that year there were already a Maori settlement and flour-mill, three European farms and several military camps in the district (Fig. 1).

POKINO

The name 'Pokeno' comes from a pre-war settlement of the Ngati Tamaoho people, which was not, however, at the present township site. Figure 3 shows the location of the 'Pokino' Maori settlement from a 'Map shewing the Line of Posts established between the Frith of Thames and the Mangatawhiri River', published by the War Office in London in the official journals of the Deputy Quartermaster General in New Zealand, Crimea veteran Lieutenant Colonel Dominic Jacotin Gamble (War Office 1864). Ngati Tamaoho informants have stated to the writer that the correct name for the Maori settlement, and hence now for the district as a whole, is 'Pokino', as indeed is commonly written in early military reports. The exact location of Pokino has not been found but was approximately as shown on Figure 1. A manuscript map of the Great South Road from Drury to the Waikato River, dated January 1862, also by Gamble (1862), notes 'To Pokino 3/4 mile' at Austin's Farm on the Great South Road, where there was a camp of soldiers engaged on road works (see below).

John Martyn, a settler from the Ramarama district near Drury, visited Pokino village in 1860, describing it as approximately a mile from the well-known water-mill on the stream that runs through the valley.

> 'It is beautifully situated, having a fine view of the river, and the adjacent country. Indeed, one and all we thought it the prettiest place we have seen in New Zealand. The land is very good. Indeed, you seldom see Maoris choose bad land for cultivation. They were just harvesting their wheat, which is an excellent crop. They take great care of it, putting it in round mows like reed. They also have one of Ransome's portable threshing machines, and a mile from the settlement they have a flour mill, worked by water power. So you see in some respects they are not behind the Europeans. Maize, potatoes, peaches, and dried shark they have in abundance.' (Morris 1965: 102)

Photographs in the Alexander Turnbull Library attributed to Assistant Surgeon William Temple, Royal Artillery (later awarded a Victoria Cross at Rangiriri), include some likely to have been taken at Pokino village in early 1862. Morris (1965: 115–116) states that Pokino was destroyed by an unauthorised expedition of soldiers from Queen's Redoubt on the night of 11 July 1863, the eve of the crossing of the Mangatawhiri River at the start of the Waikato War. Colonel Gamble reports only that,

> 'The village of Pokino, two miles from the Queen's Redoubt, has been abandoned by the natives, who left behind four carts, flour, potatoes, &c., of which possession has been taken. An officer's picket of twenty men are sent there daily as a post of observation.' (War Office 1864: 46)

Fig. 3. The Maori settlement of Pokino is marked on part of a 'Map shewing the Line of Posts established between the Frith of Thames and the Mangatawhiri River', from the journals of the Deputy Quartermaster General in New Zealand (War Office 1864). Also shown are Maori settlements, military posts and pre–war European settlers south of the Waikato River.

MANGATAWHIRI AND THE POKINO MILL

In March 1858 members of the Austrian 'Novara' scientific expedition visited a Maori settlement called 'Mangatawhiri' close to the Pokino mill. It seems likely Mangatawhiri was abandoned for the new site at Pokino between then and Martyn's visit in 1860. There is no indication of Mangatawhiri being occupied when Queen's Redoubt was established in 1862. 'Novara' scientist, Ferdinand von Hochstetter, describes Mangatawhiri as having,

> '. . .about twenty huts with about 100 inhabitants, who are enjoying considerable wealth. They very recently had a neat flour-mill built by an Englishman, on a small stream running by the village, which cost them not less than £400. The volcanic soil of the neighbourhood is extremely fertile, and there is no scarcity of horses, cattle and pigs in these parts.' (Hochstetter 1867: 290)

Mangatawhiri village is located on Hochstetter's map of the Waikato and Rotorua districts (Hochstetter and Petermann 1864) near Tani Te Whiora stream, a tributary of the Mangatawhiri River. 'Novara' expedition artist Joseph Selleny's picture of the settlement shows a mix of Maori and European clothing, several pigs, two small whare in the foreground and others, including a larger house, beyond (Fig. 4). The distant skyline locates the settlement to the broad spur below the south end of today's McGill's Road, north of the stream. The mill itself would have been out of sight in the stream valley at or beyond the right end of the picture.

The flour-mill on Tani Te Whiora Stream (now also known as Leatham's Stream), was *ca* 150 m east of the present motorway bridge. A race from above a small waterfall carried water to the

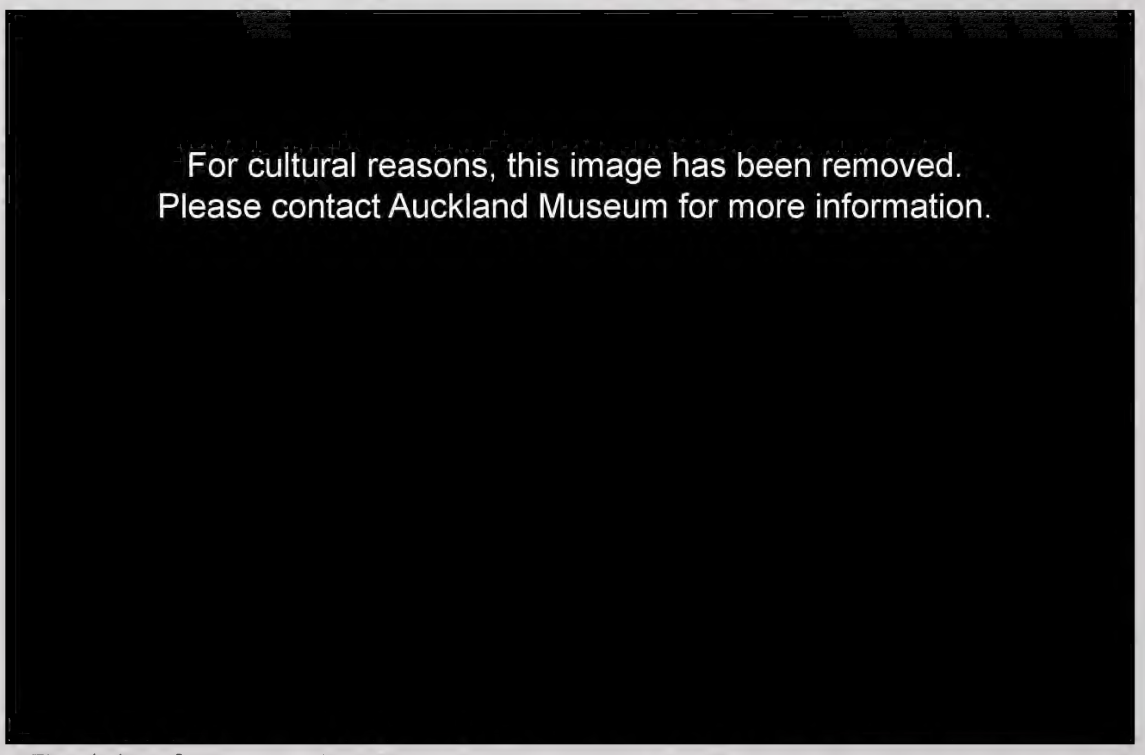


Fig. 4. 'Dorf Manga tawhiri. Neuseeland'. Pencil drawing by Joseph Selleny of the Austrian frigate 'Novara', 1858. (Hocken Library)

mill *ca* 50 m downstream, where concrete foundations still hold the iron hub of a waterwheel. Below the mill, a 25 m long race with large boulders placed at each side returns the water to the stream. After the war a European flax-mill made use of the water-power and plant, replacing the flourmill on the site.

GREAVES' MAP

A map by Captain George Richards Greaves, 'Sketch of the Country on the Right Bank of the Waikato River near the Mouth of the Mangatawhiri', dated 5 May 1862 (Fig. 5), published in the 'Journals of the Deputy Quartermaster General in New Zealand' (War Office 1864), shows the Pokeno district before the Waikato War. Greaves served with the 70th (Surrey) Regiment, was Deputy Assistant Quartermaster General in New Zealand from January 1862 to January 1866, and is responsible for several maps of the Waikato campaign.

The map shows the original line of the Great South Road to Te Ia on the Waikato River, going past the Austin and Selby farms to traverse the hill south-west of today's Pokeno township before descending to cross the swamp to the river. At the left edge of the map the road forks at the corner of today's Helenslee and Munro Roads. Grey's road continued down Munro Road before climbing the hill south of the Pokeno Road (to Tuakau). 'P' marks the high point on the hill west of Pokeno. 'B' is Bluff Stockade.

Also shown is the branch road past Sagg's farm and Queen's Redoubt (E, C, D). The redoubt location was decided but construction had not begun by the date on Greaves' map. At the south end of the road on the right bank of the Mangatawhiri River is an 'Old Pah', which is described by Colonel Gamble (War Office 1864: 18) as standing 18 feet (5.5 m) above the swamp. It was here that the 14th Regiment crossed the river on 12 July 1863 to commence the Waikato War. The pa was then refashioned into a small stockade and earthwork fort to control the crossing-place.

Greaves' map locates three European farms in the Pokino district before the war. Sagg's farm is alongside the road to the mill—the road as far as the farm being made use of by the military in 1862, beyond which a new road diverged to the redoubt site. The farm buildings can be seen in two photographs of Queen's Redoubt (Figs 8 and 9), at the north end of today's Pokeno township. The Selby farmstead is shown near the west end of today's Hitchen Road, where it follows the original line of Great South Road up the hill. The farmhouse of Austin (or 'Austen', for example in Colonel Gamble's reports: War Office 1864: 1) was west of the original Great South Road, now Munro Road, *ca* 200 m south of the Helenslee Road corner.

European troops were occasionally camped at Selby's farm in 1862 and 1863. In late May 1862 and again in June General Cameron stayed there to review the work going on at Queen's Redoubt and Bluff Stockade (War Office 1864: 22, 24). For a few weeks from October that year the newly formed Forest Rangers were based at Selby's farm (Stowers 1996: 30).

POKINO CAMP

The first military camp set up in the Pokino district for troops engaged in road-making was on Austin's farm, where detachments of the 12th and 14th Regiments numbering 694 rank and file, plus officers, arrived on 26 December 1861 (War Office 1864: 5). Pokino (sometimes 'Pokeno') Camp was named after the nearby Maori village. Two photographs by Assistant Surgeon Temple (see above) show the camp in early 1862. The general view (Fig. 6) dates from before 7 April 1862 when a detachment of the 40th Regiment was added to the garrison (War Office 1864: 15). The other picture of the camp shows a group of officers including Lieutenant Charles James Urquhart, 65th Regiment, who left for England in April 1862 (War Office 1864: 18). All Temple's

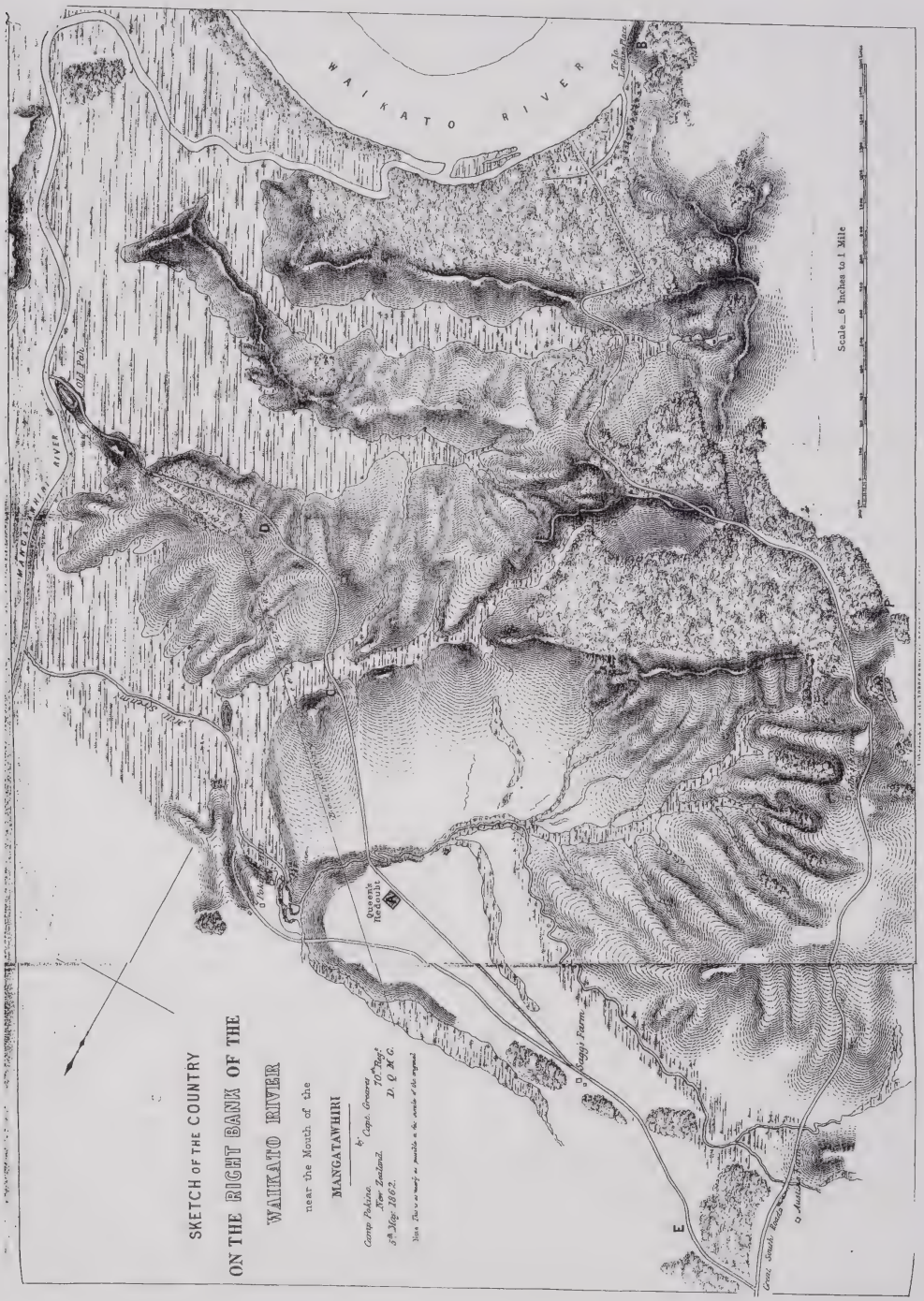


Fig. 5. 'Sketch of the Country on the Right Bank of the Waikato River' (Gamble 1864). Captain Greaves' 5 May 1862 map of the Pokeno district marks the location of Queen's Redoubt a month before construction work began. Other places are discussed in the text.

Fig. 6. 'Camp of the 2nd Battalion, 14th Regiment, and the 1st Battalion, 12th Regiment, Pokeno'. Pokeno Camp, early 1862. The view is to the south. A post–and–rail fence at left marks the Great South Road. Photograph probably by William Temple. (Urquhart Album, Alexander Turnbull Library)

Fig. 7. 'Mess Whare. 12th regt. Camp Pokeno. N.Z.' Officers in this photograph are, from left: Lieutenant W.L. Murphy, Lieutenant H.M. Lowry, Captain T.E. Miller, Major W.J. Hutchins, Lieutenant C.J. Urquhart (65th Regt), Lieutenant W.C.S. Mair and Captain F. Williams. All except Urquhart were with the 12th (East Suffolk) Regiment. Photograph taken by William Temple, early 1862. (Alexander Turnbull Library C15954)

photographs in the district are likely to date from this early 1862 visit. Urquhart's own album in the Turnbull Library is an important source of New Zealand War photographs.

Figure 6 looks south to the hill crossed by the Great South Road on its way to the Waikato River. A post-and-rail fence to the left marks the road; another fence runs through the camp into the gully at right. Camp Pokino was on the west side of Helenslee Road, at the present corner with an unnamed no-exit road, which runs west across a headwater gully of the Tani Te Whiora Stream. The photograph shows as many as 80 bell tents, three or more larger tents, and low, thatched buildings. In campaign conditions bell tents accommodated 12 rank and file. The commanding officer had his own, and other officers also had their own, or shared according to rank. Other tents accommodated the guard, commissariat, doctor and hospital. The 12th Regiment officers' mess in Figure 7 looks like a building at the left end of the camp near the road in Figure 6; it may have been made by local Maori.

Throughout the first half of 1862, Pokino Camp was the major road-making establishment at the forward end of the Great South Road, with hundreds of soldiers in residence. On 12 April the headquarters and part of the 40th Regiment was ordered from Baird's Farm near Ramarama to Pokino Camp (War Office 1864: 16). In June the workforce was broken up and Pokino Camp was abandoned. On 6 June, 449 officers and men of the 40th Regiment marched from Pokino to Baird's Farm on their way to winter quarters in Auckland (War Office 1864: 22). On 10 June the 14th Regiment left, followed three days later by remaining men of the 12th Regiment (War Office 1864: 24). By this time Queen's Redoubt was under construction, and took over from Pokino Camp as the major military base at Waikato's northern frontier.

BLUFF STOCKADE

The decision to establish a post near the Te Ia landing place on the Waikato River was taken in March 1862 (War Office 1865: 73), but it was not until 19 May that 50 men from the 12th, 14th and 65th Regiments moved there from Pokino Camp (War Office 1864: 20). Carpenters were already at the site preparing timber for huts (War Office 1864: 21). A week later 50 more men were added to the working party at the stockade.

Bluff Stockade was built of split 14 ft (4.3 m) lengths of tree trunk, 4 ft in the ground and 10 ft above. The sides were 50 and 46 feet (15 and 14 m) in length. Inside were huts for the men and a commissariat store and magazine (War Office 1864: 21). Bluff Stockade was important landing place and staging post on the Waikato River throughout the war of 1863–64.

QUEEN'S REDOUBT AND THE WAIKATO WAR

GREAT SOUTH ROAD

When George Grey returned to New Zealand in September 1861 to commence his second term as governor, he quickly saw that Tainui tribes and the King Movement (Kingitanga) lay at the heart of resistance to British law and government. The primary objective of Kingitanga was to develop a government to rule over Maori, just as the Queen and colonial government ruled over Pakeha. In effect, there would be parallel states. Also, the King Movement firmly blocked expansion of the Pakeha settlement of Auckland south into the rich lands of the Waikato. Grey determined to overcome the challenge to British authority, even if it meant war.

In a letter of 19 December 1861, after a visit to the Waikato, Grey asked General Cameron to put the troops to work on constructing a road from Drury to the Waikato River, in order to, '. . .undertake either defensive or aggressive operations against an enemy as circumstances may require' (War Office 1865: 69). At the time there was a metalled road from Auckland as far as

Papakura, and a clay road a further three miles to Drury. In May 1853 a surveyor by the name of Hayr had fixed on a route through the ranges between Ramarama and Pokeno, which was soon after made into a bridle track (Morris 1965: 95). In the late 1850s improvements were made to the track through the bush (see also Hochstetter 1867: 289–290), but this was not an all-weather road for wheeled transport and large bodies of men, as was now required.

The troops began marching out from their quarters at Auckland and Otahuhu on Christmas Eve 1862 (War Office 1864: 1). Two days later there were 2300 men in four camps between Drury and Pokeno. Work on the road itself commenced on 1 January 1862 (War Office 1864: 3). Detailed reports on the road-work south of Drury in the summer, autumn and early winter of 1862, are given in Colonel Gamble's reports (War Office 1864). The task of cutting through thick bush country and over steep hills, and forming and metalling the new road to Pokeno and the Waikato River, was completed at one o'clock on 18 June 1862 (War Office 1864: 24).

QUEEN'S REDOUBT

On 20 March 1862 General Cameron reconnoitred a '. . .proposed line of extension from Great South Road, to the Mangatawhiri River, by which route any military operations in the Waikato country would be undertaken' (War Office 1864: 14). Four days later Grey wrote to Cameron asking that a post for 500 men be established near the Mangatawhiri River. Cameron replied, agreeing with Grey and adding that he wished also to establish a post on the Waikato River near Havelock (War Office 1865: 73). This was to be the Bluff Stockade. On April 12 Cameron decided on the location of a military post for 450 men near Pokino (War Office 1864: 16). On May 28 General Cameron again visited the site, and fixing the position of the redoubt and encampment for the men (War Office 1864: 22). Cowan (1922–23 I: 242) gives the place-name 'Te Kūi' at the redoubt site, and Lennard (1986: 20) gives 'Te Ruato'. The source is not given for either name.

Gamble (War Office 1864: 17) relates some of the considerations regarding the location of the new post:

> '. . .the force at post A [see Fig. 5] would be immediately available for a forward movement, and the position itself become favourable for the formation of a military depôt. The situation is open, clear of the bush, and the nearest commanding height in the neighbourhood is 800 yards distant.
>
> The troops to be there stationed will be hutted and entrenched, and arrangements have been entered into with contractors for the delivery of sawn timber on the spot.'

Work began immediately on supplying necessary timber to the site. The contractors, however, soon encountered problems. Those who had undertaken to deliver 100,000 feet of sawn timber to Pokeno by 1 June gave up their contract after visiting Pokeno in late April, and discovering unmetalled sections of road that were virtually impassable after two or three days of rain (War Office 1864: 18).

On 9 June 1862 the site of Queen's Redoubt was occupied by 150 men of the 70th Regiment from the Baird's Farm camp at Ramarama, and 140 of the 14th Regiment from Camp Pokino (War Office 1864: 24). On 13 June General Cameron inspected work on the new post. Colonel Gamble writes:

> 'This redoubt will be 100 yards square, with a caponnière at each of two opposite angles for the defence of the ditch. A commissariat store, hospital, and huts, for the accommodation of the troops, will be provided inside.' (War Office 1864: 24)

On 18 June 120 men of the 65th Regiment from Baird's Farm joined the troops at the Queen's Redoubt site (War Office 1864: 24), so that there were more than 400 men working on the fort's defences, buildings and other facilities. Rank and file were all under cover by 28 September and officers three weeks later (War Office 1864: 26).

Orders were given on 1 November 1862 for completing a 30 ft (9 m) wide road to the Mangatawhiri River; it was commenced two days later (War Office 1864: 26). At the end of November another company of the 40th Regiment arrived at Queen's Redoubt, and by early December there were 370 men were working on the road southwards (War Office 1864: 28). This section of road was completed on 31 March 1863. Meanwhile, orders were given on 19 February for the erection of an 'electric telegraph' wire between Auckland and Pokeno (War Office 1864: 29). Construction commenced on 17 March, and by early July it had reached Drury (War Office 1864: 42), just in time for use in organising troop movements between Auckland, Otahuhu and Drury in the lead-up to the Waikato War. On 15 August the line of telegraph was surveyed from Drury to Pokeno.

THE CAMPAIGN

On 11 July 1863, one day before the start of the Waikato War, General Cameron moved his headquarters to Queen's Redoubt (War Office 1864: 44). The redoubt was headquarters of the British Army in New Zealand until the fight at Rangiriri on 20–21 November when Cameron shifted up-river to Rangiriri, in readiness for the next phase of the war.

On 12 July men of the 14th (Buckinghamshire) Regiment crossed the Mangatawhiri Stream and took up positions on the spur beyond (overlooking the present railway line and State Highway 1), thus signalling the start of the Waikato War. Over the following spring, summer and autumn British troops and other government forces advanced south to Te Awamutu and beyond, many thousands passing through Queen's Redoubt on their way to war.

For some time the fort was itself in the front line. In July, August and September 1863 there was fighting on or near the Great South Road north of Queen's Redoubt, and Maori attacks on European farmhouses and outposts in South Auckland districts. Bush was felled on both sides of the road to prevent more ambushes of military and other parties on the road. On 2 September Ensign Dawson of the 2nd Battalion 18th Royal Irish was in charge of a patrol from Queen's Redoubt that was attacked near the nearby Maori village of Pokino, from which the inhabitants had been driven when the war began.

On 7 September the supply depot at Camerontown down-river from Tuakau was taken and sacked by Maori forces. The firing was heard at Alexandra Redoubt (above the river at the present Tuakau bridge) and Captain Swift led a party from that post to intercept the attackers. In the skirmish that followed Swift was killed and his second-in-command, Lieutenant Butler, wounded. It was left to Colour-Sergeant McKenna to extricate the small force—for which he was awarded the Victoria Cross. McKenna's V. C. and New Zealand War Medal are on display in the Auckland Museum.

In late November Cameron overcame the Maori defensive line at Rangiriri and the way was opened to the heart of the Waikato. At the same time troops landed on the western side of the Firth of Thames and three new redoubts—the Miranda, Esk and Surrey—were thrown up between there and Queen's Redoubt. These were to put an end to Maori control of the Hunua Ranges, from which the Great South Road had come under attack earlier in the war.

Thus Queen's Redoubt was at the heart of a network of Pakeha fortifications—down the Great South Road from Auckland, west to the rich lowlands between Manukau Harbour and the Waikato River, east to the Firth of Thames, and south to the campaigning troops. Bluff

Stockade controlled a Waikato River landing where men and stores were loaded into transport vessels for passage up-river to the war.

As the war moved south, troop numbers at Queen's Redoubt were reduced. In June 1864 it was reported that very few soldiers were at the post, and that there were few convoys from Drury since river transport was now used from the Waikato Heads to supply the occupation army in the Waikato (*Daily Southern Cross* 24 June 1864).

AFTER THE WAR

The Rev. Vicesimus Lush described Queen's Redoubt in January 1865 as being 'alive with soldiers' (Lush 1982: 46). On 17 July Lush was back at Queen's Redoubt conducting a morning service for the troops (Lush 1982: 50). On 19 August 1865 he returned to the redoubt and dined in the officers' mess on whitebait soup, eels and roast beef. Lush's host was Lieutenant Arthur Brittain, the commanding officer, Major Thomas Miller, being temporarily absent in Auckland. Both officers were of the 12th (East Suffolk) Regiment (Hart 1862: 247–248), and it seems that the 12th provided the garrison at the post at that time. Next day being Sunday, Lush conducted a morning service for about 50 soldiers (Lush 1982: 55).

Major Miller was still at Queen's Redoubt in June 1866, when the Rev. Lush again visited (Lush 1982: 87). While there, Lush learned that Governor Grey had issued a proclamation to the effect that the war was at an end. 'The Officers at Mess hoped that now they should escape from what they were pleased to call "this horrid country".' In August he again dined at the mess, but by March 1867 the military had quit Queen's Redoubt and Lush had to find alternative accommodation, greatly missing the officers' hospitality (Lush 1982: 110).

The end of Queen's Redoubt is signalled by an advertisement in *The New Zealand Herald* of Wednesday 13 March 1867, for an auction of buildings to take place at the redoubt the following Saturday at 10 a.m. In the same notice imperial authorities advertise the sale of '. . . all the houses, stores and buildings' at Te Rore, Whatawhata and Ngaruawahia. This marks the departure of imperial troops from the Waikato.

The advertisement lists 22 Queen's Redoubt buildings to be sold, 'with other lots too numerous to particularise'. The list of buildings is given here exactly as presented in the advertisement, since building sizes are not always clear—to the writer at least. Measurements include feet and inches.

3	BUILDINGS,	66 x 18, 6 x 7, 4
2	_	64 x 13 x 7, 4
6	_	54, 51 x 20, 4, 18, 6, 20, 6 x 8, 7, 4, 8, 6
1	_	50, 6 x 18, 6 x 8
3	_	49, 41, 37 x 18, 6, 10 x 7, 4, 8, 6
2	_	26 x 7, 6 x 6, 3
2	_	23, 18, 6 x 13, 12 x 7, 4
2	_	15, 5, 15 x 6, 18, 6 x 6, 3, 8
1	_	8, 6 x 6, 6 x 7

Examination of the figures gives the size of all the buildings—assuming a consistent order of dimensions—except for nine buildings in the third and fifth lines. In November 1867, the Rev. Lush (1982: 132) found the redoubt 'fast crumbling into ruins'.

In late 1868 a stockade was put up at Pokeno, '. . .on a hill west of the Queen's Redoubt. . .' to reassure an influx of new settlers who were coming into the district at that time (Morris 1963:

143 and 147). Next year, European settlers were alarmed at news of Te Kooti being in the Waikato. Pukekohe settler and newspaper correspondent William Morgan wrote in his diary on 24 July 1869: 'Waiuku and Wairoa Volunteers and Militia have. . .been sent up to Mercer and the Queen's Redoubt' (Morris 1963: 144). It is unclear if this reference is to a still defensible fortification or just to the location.

Some later history of the Queen's Redoubt site was recounted to the writer by the late Mr M. R. Dean, who visited the site in the course of the 1992 excavation. Mr Dean was born in 1914 into an old Pokeno family and lived most of his life in the district. He recalled the redoubt ditch full of water and stated that it was filled in by Johnny Cronin in the 1920s by means of a horse and scoop. At that time the land was owned by 'old McDonald', presumably of the family remembered by McDonald Road, on the other side of Great South Road from Queen's Redoubt.

THE FORTIFICATION

Earthwork redoubts have a long history in European warfare, and in colonial or imperial wars of the 19th century and earlier. The plan shape—or 'trace'—of the earthwork was marked out on the ground, usually square or rectangular, but of other shapes as well depending on the lie of the land the engineer's wishes. Under the supervision of men of the Royal Engineers, the troops would then dig out a defensive ditch, in New Zealand usually 6 ft (1.8 m) deep and about 8 ft (2.4 m) across. The spoil was thrown up on the inner side to a height of 8 ft (2.4 m), to present an attacking force with a 14 ft (4.2 m) obstacle from the bottom of the ditch. Behind the parapet was a raised 'tread' on which defenders could stand to fire over the wall if necessary (see cross-section in Prickett 2002: 23).

Projecting bastions at two or more corners enabled the garrison to fire into the ditch should attackers get in beneath the walls. These were commonly in the form of an earthwork, although in some redoubts where a long-term role was envisaged loop-holed blockhouses were used, as at Queen's Redoubt. Examples of blockhouse bastions can still be seen at Manaia Redoubt, south Taranaki (see Prickett 1994: 16). There was usually just one entry to redoubts, this being a weak point. Queen's Redoubt was one of only two redoubts in New Zealand known to have more than one entry, the other being Camp Waitara in Taranaki, dating from 1860. A drawbridge over the ditch to the gate was raised at night for security.

Most New Zealand redoubts were small. One and two company earthworks were *ca* 35 yards (32 m) and 42 yards (38.4 m) square respectively—giving areas of 1024 and 1475 square metres. A company in the British army comprised about 120 officers and men. Redoubts were mostly located in open country, on level or nearly level ground, to offer a good field of fire for defenders. Like other New Zealand War fortifications—Pakeha and Maori, redoubts could have a variety of roles, tactical—that is, for short-term battlefield advantage, or strategic—designed to hold a frontier, protect communications, or occupy land.

Queen's Redoubt was 100 yards (91.4 m) square within the defences. At 8360 m^2 it was one of the largest British Army redoubts of any New Zealand campaign. The only work to match it in size was Camp Waitara, which was of an irregular shape, and built in two stages to total *ca* 8500 m^2 internally. Inside Queen's Redoubt was a central parade area, and 27 huts (see Figs 8 and 11) serving as guardrooms, officers' quarters, stores, hospital, and accommodation for 450 men.

THE PICTORIAL RECORD

Two photographs of Queen's Redoubt and its associated camp probably date from 1863 when there were large numbers of troops in the northern Waikato, before the war moved on to the

Fig. 8. Queen's Redoubt and camp from the south, 1863. (D.M. Beere Collection, Alexander Turnbull Library G96088½)

Waipa and Te Awamutu districts in early 1864. Prints of the D. M. Beere photograph are held in the Auckland War Memorial Museum (Lush Collection) and Alexander Turnbull Library. There is a pencil and watercolour copy of the Beere image in the Marmon Album, Alexander Turnbull Library. The second photograph is from the Ruck Album in the Auckland Museum library.

The Beere image (Fig. 8) shows Queen's Redoubt from the south, looking west of north. The extension of the Great South Road to the Mangatawhiri River runs across the picture, with a post and rail fence to one side of it in the right foreground. Sagg's farmhouse and shed are visible against trees in the distance at the far left (for the location, see Fig. 5). A gap in the trees on the skyline (above the right corner of the redoubt) shows where the Great South Road crosses the distant ridge.

The earth wall of the redoubt can be seen from the north-east to the south-west angles of the fortification. At the fort's extremities are small buildings, with gable ends facing into the redoubt interior and a hipped style of roof at the other (outer) end. These were blockhouse bastions, which sat on a platform jutting out from square of the redoubt, with access by way of a gap in the earth wall. The blockhouses would have had loop-holed walls, packed with earth, sand or gravel to stop incoming fire. The redoubt interior is tightly packed with huts, the smaller ones apparently clustered at the Great South Road end, where the main access would have been.

On the other side of Great South Road is a camp made up of *ca* 30 bell-tents and six larger tents, plus several small sheds and one large wooden shed. The tents would have accommodated troops who were part of the build-up at the post early in the campaign. More sheds can be seen on the redoubt side of the road. The foreground in dominated by bracken and tutu, while the redoubt and camp area is cropped grassland.

The Ruck Album photograph (Fig. 9) was taken from further from the redoubt than the Beere picture, and from slightly further east—so that the view is more to the north-west. The Beere picture appears to have been taken from a position on the ridge at the left of the Ruck image. The apparently identical location and size of huts in the two pictures suggests they were taken about the same time, although from the greater number of tents, the Ruck picture may be the earlier, and date from the height of the build-up of troops at the redoubt in July. Again the Great South Road and fence can be seen to the right, and Sagg's homestead is at the upper left. As in the Beere picture the bastion blockhouses delineate the redoubt.

A third view of Queen's Redoubt is a copy of an original drawing by Lieutenant Henry Stratton Bates (Cowan 1922–23 I: 241; Fig. 10). Bates was commissioned in the 65th Regiment in 1854, took part in the 1860–61 Taranaki War, and was Native Interpreter on Cameron's staff from 1861 to October 1863 (Raikes 1885: 44–45). The picture shows an extensive camp south of the stream, and tents north of the stream at the right, where none are shown in the two photographs. The Beere photograph has additions at both ends of a shed at the right, to show that Bates' sketch is earlier. Bates was at Queen's Redoubt in July and August 1863 (he took part in a 1 August reconnaissance of Paparata pa): his drawing probably dates from July.

Figure 11 is a perspective drawing from a broadsheet advertisement: 'Queen's Redoubt. Pokeno. Plan of Allotments for sale. Saturday 9th July 1864 at 12 o'clock.' It shows the redoubt from the north a year after the other pictures. To the right, across Great South Road, is Queen's Hotel; a church is shown on the east side of today's Selby Street. The 'Presbyterian Church Site' is marked on a May 1879 plan, SO 2024 (Land Information New Zealand). Although we cannot be certain of the drawing's accuracy, the earthwork bastions shown may by then have replaced the blockhouses pictured in 1863. The arrangement of 27 huts inside the redoubt appears to conform to the Beere photograph. Two huts between the fort and the stream may represent buildings visible in the photographs.

Fig. 9. Queen's Redoubt and camp from the south, 1863. (Ruck Album, Auckland War Memorial Museum)

Fig. 10. Copy of an original drawing of Queen's Redoubt, 1863, by Lieutenant Henry Stratton Bates (Cowan 1922–23 I: 241).

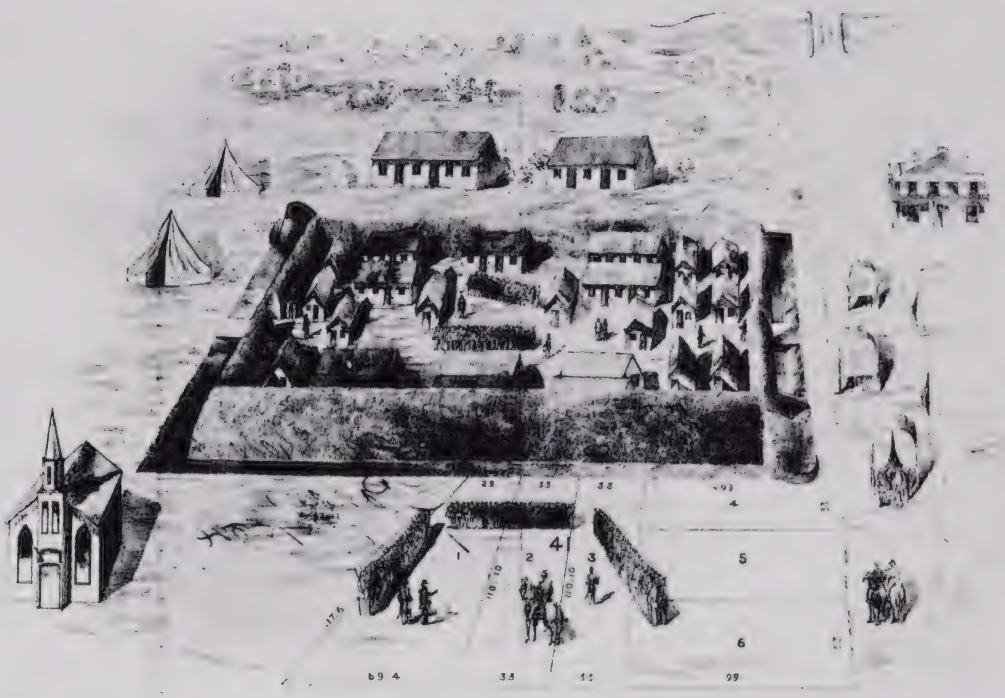


Fig. 11. Perspective drawing of Queen's Redoubt from a broadsheet advertisement: "Queen's Redoubt. Pokeno. Plan of Allotments for sale. Saturday 9th July 1864 at 12 o'clock." The advertisement includes a plan of the sections for sale. (Auckland City Libraries)

THE EXCAVATIONS

Archaeological excavations were carried out at Queen's Redoubt in the period 18–28 February 1992. Objectives were: examination of the defensive ditch and north-east corner bastion, some exploration of the redoubt interior, and recovery of items of material culture relating to the military period. Four areas were opened up and were numbered as the work began (Fig. 12). Excavation was carried out by hand, except for the use of a 'bobcat' digger to remove turf from excavated areas and partly excavate the Area I ditch. Artefacts recovered are described as a single assemblage in the next section of this report.

AREA I

A trench was excavated across the defensive ditch on the east side of the redoubt, *ca* 30 m south of the north-east corner bastion (see Fig. 12). Initial excavation was carried out by machine, after which an 8 x 1 m trench was excavated by hand across the ditch and for a short distance on adjacent banks to each side (Fig. 13). Fragmentary artefacts were found in all fill layers.

The defensive ditch was dug through topsoil into *ca* 1.7 m depth of stiff yellow clay, and below that, *ca* 300 mm into a hard yellow-red clay (Fig. 14). Fill was made up of four main

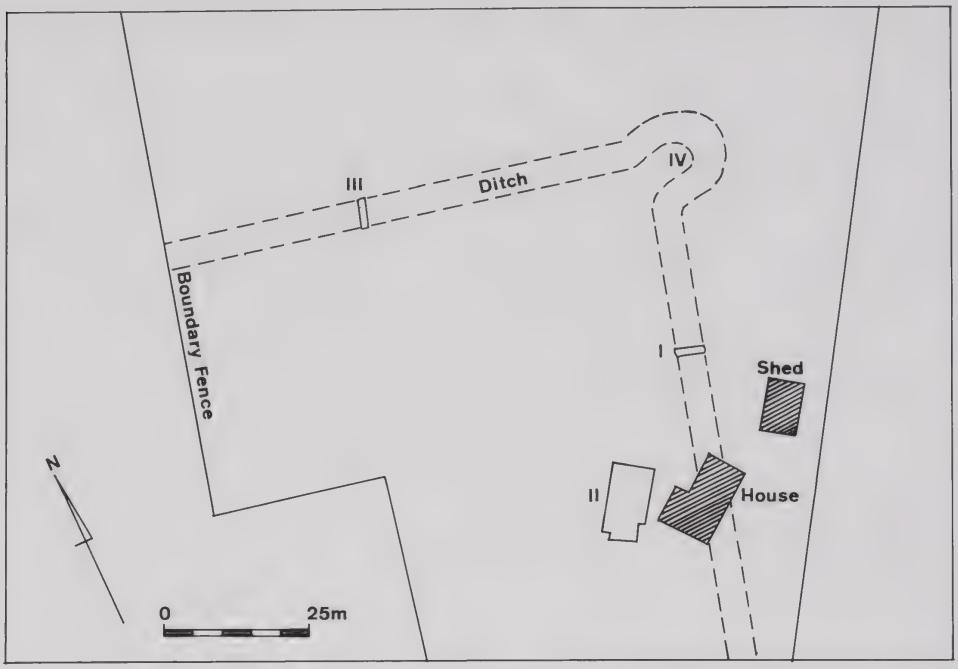


Fig. 12. Queen's Redoubt excavated areas.

Fig. 13. Area I showing the north side of the trench across the redoubt defensive ditch. Range poles intervals are 250 mm.

layers. Layer 1 was a soft yellow-brown loam, tending brown to the west and yellow to the east (outer) side of the ditch, including some lumps of brown material. The variation reflects material available on the two sides of the ditch when it was filled in the 1920s—the inner (west) side making use of what was left of the redoubt bank, and the east side including more clay from under the topsoil. Layer 2 was a uniform dark brown loam, made up of topsoil which will have been the first material put into the ditch in the filling operation. Layers 3 and 4 are made up of erosion fill washed into the ditch after abandonment of the site and before the ditch was filled in the 1920s.

The width of the redoubt ditch is revealed in the cross-section (Fig. 14). The flat bottom is *ca* 2.4 m (*ca* 8 ft) wide, and is *ca* 2.25 m below the ground surface—likely therefore to have been dug to an ordered depth of 8 ft if we allow for the lower level of the present ditch fill surface as a result of settling. Because of erosion of both sides of the ditch the width at ground level is more difficult to determine. Assuming the sides continue on the relatively steep angle of the bottom part of the ditch cross-section, the ground level width may have been *ca* 4.5 m, i. e. *ca* 15 ft.

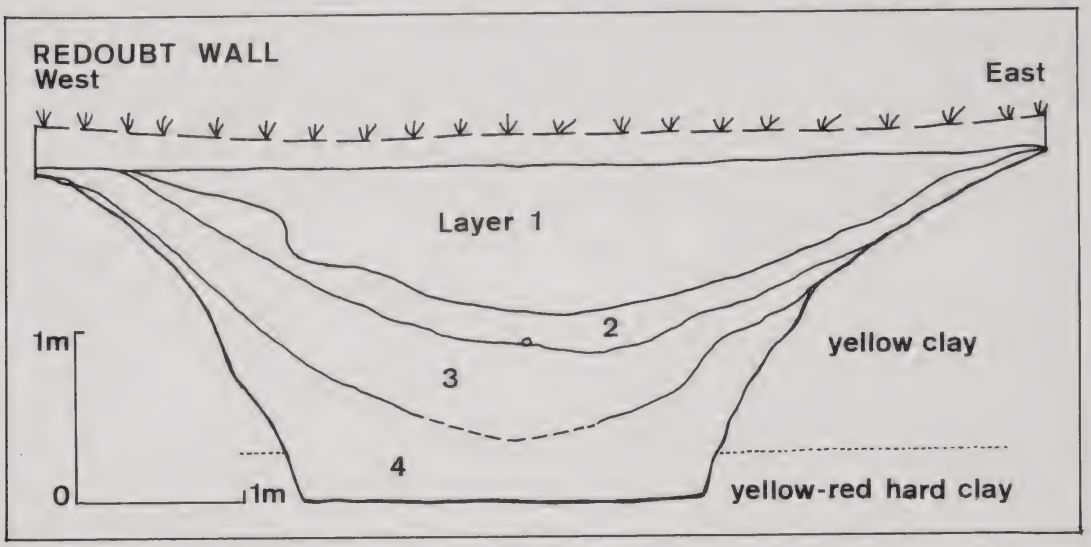


Fig. 14. Area I, north section. Layers 1–4 are described in the text.

AREA II

A small part of the redoubt interior was explored at Area II, by means of an irregular-shaped excavation *ca* 14 x 7 m (Fig. 15). Topsoil was stripped off by machine before excavation was carried out by hand. Fragmentary artefacts were found throughout the area.

The excavation revealed 28 postholes, probably belonging to two adjacent buildings *ca* 2.5 m apart (Fig. 16). In neither case was the complete building found. Most postholes were shallow, 12 being less than 150 mm in depth and except for two, no others being more than 310 mm. The exceptions were 430 mm and 470 mm deep respectively ('A' and 'B' in Fig. 16). All postholes are likely to belong to regularly arranged foundation piles, except for two pairs of smaller holes ('C'), probably on the sides of a building *ca* 5.5 m wide This may relate to the common 18 ft 6 inch Queen's Redoubt building width, as in the March 1867 auction list (see above). The building length was not determined, but was at least 9 m. The only feature other than postholes was a slight scarp of 50–100 mm at the south corner of the excavated area ('D').

Fig. 15. Area II, view to the north showing the gap between postholes of two adjacent buildings. The Area I and IV excavations can be seen in the background.

Fig. 16. Area II, excavation plan.

AREA III

The defensive ditch was further investigated half-way along the north side of the redoubt (see Fig. 12). This was about where one of the two gates is shown in the 1864 perspective drawing (Fig. 11), and it was hoped to obtain some knowledge of the gateway arrangement. In the event, no evidence of an entrance was found, Area III providing only another ditch cross-section to add to that of Area I (Fig. 17).

Material in the Area III redoubt ditch is made up of a similar four layers to that in Area I. Layer 1, as much as 1.2 m deep in the middle of the ditch, is loose yellow fill including lumps of brown material. Falling into the ditch from the south side (from the redoubt wall and interior) are bands of yellow clay and black soil, 50–80 mm thick. Layer 2 is mostly loose brown fill with some blocks of black and paler material. Layers 1 and 2 are made up of material dumped in the ditch by the in-filling that took place in the 1920s, and in the same manner as in Area I. Layer 3 is re-deposited yellow clay. Layer 4 is compact, water-deposited grey clay including some iron rust, to suggest water lying in this part of the ditch, probably after abandonment of the redoubt.

The ditch dimensions proved similar to that in Area I. In Area III the flat bottom of the ditch was *ca* 2.3 m (7 1/2 ft) across, i. e. *ca* 100 mm less than the base width in Area I. From the bottom, the Area I and III ditch profiles both climb steeply for a metre or more before becoming less steep. The Area III ditch sides may be closer to the original profile, being steeper than in Area I, which appears to have suffered more from damage during filling-in and by natural erosion before then. Thus Area III may give a better indication of the width of the ditch at ground level, at *ca* 4.8 m across (16 ft).

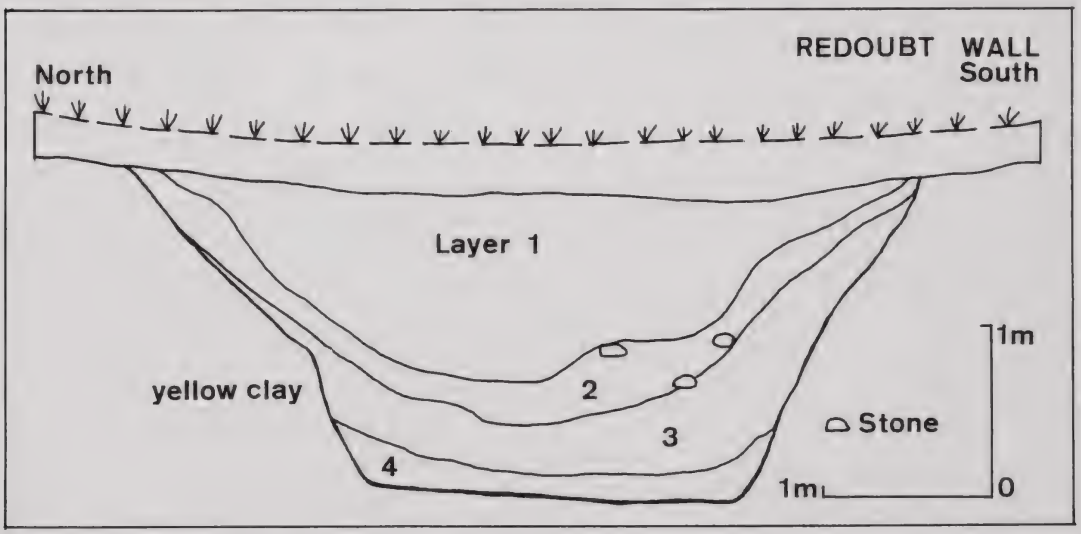


Fig. 17. Area III, east section.

AREA IV

An irregular-shaped excavation at the north-east corner of the redoubt explored the bastion and the defensive ditch around it (Fig. 18). Excavation of the whole of this large and complex area was not possible in the time available, so that the location and description of the redoubt ditch where it rounded the bastion involved five partly or fully excavated trenches, across the defensive ditch and more extensively in the area of access from the redoubt interior into the bastion. These

Fig. 18. Area IV, view to the north–west from outside the redoubt, across the defensive ditch to the pebble path into the bastion (at right of the two figures). The Area III excavation can be seen in the background.

revealed a defensive ditch *ca* 5.75 m across at ground level, i. e. slightly wider than was apparent at Areas I and III. Part of the outer rim of the defensive ditch was followed as it began to loop around the bastion, thus allowing projection of the outer rim of the ditch around the redoubt angle (see Fig. 20).

Descending from the redoubt interior to the bastion area was a stone path, 5 m long in the excavated area (it continued into the baulk), and 750–1500 mm wide (Fig. 19). The angular stones were probably broken by soldiers who quarried and broke up a great deal of stone in the course of road-making in the first half of 1862. For some reason it did not enter the bastion from mid-way between the two sides, but was close to the north wall of the redoubt, as can be seen in Figure 20. On the path was a horse-shoe (visible left of the vertical range pole in Fig. 19). South of the path, a short drain exited into the defensive ditch (see Fig. 20).

Excavations of the defensive ditch showed the defensive ditch encircling the bastion underwent a number of changes during the original construction phase. We know from Colonel Gamble that 'caponnières' at two opposite corners were planned from the very beginning (see above). Nonetheless, for ease of construction the ditch appears first to have been dug to a simple right-angled corner, then the bastion built up and the ditch enlarged to go around it.

Across the floor of the excavated trench was found a shallow and irregular ditch, *ca* 2.5 m from the base of the outer scarp, at about the correct place for the standard width of the bottom of the defensive ditch as established at Areas I and III. Since we know that there was a bastion

Fig. 19. Area IV, looking across the pebble path which gave access to the bastion (cut by the digger above the left end of the ranging pole). The top of a 1.75 m range pole marks the depth of the adjacent defensive trench. In the foreground is the beginning of a drain falling into the ditch.

here, and yet much of the ground needed for the bastion is taken up by fill, it seems likely that explanation is as follows (see Fig. 20):

1. the ditch at the redoubt corner was first dug out to a simple right-angle;
2. then excavated out to form a loop around a bastion;
3. a timber retaining wall was then put in, the bottom of which is marked by the irregular footing trench found at the base of the excavation:
4. the enclosed ground was then back-filled to form a bastion;
5. which provided support for the blockhouse.

Figure 20 shows the presumed base of the retaining wall extrapolated from the three places it was found. The feature is, however, very shallow for the base of a retaining wall, and so a question remains as to whether it would have been strong enough for the job. Nonetheless, the interpretation is the best fit of the available evidence, since we know there was a blockhouse here, which must have sat on an earth platform.

Another question to arise from the Area IV excavation is the purpose of the gravel path. This could not have provided access to a blockhouse, unless the latter had no floor, since it runs so far down into the bastion area as to leave no room for a building. It may date from building and backfilling the bastion platform prior to construction of the blockhouse. Alternatively, and more

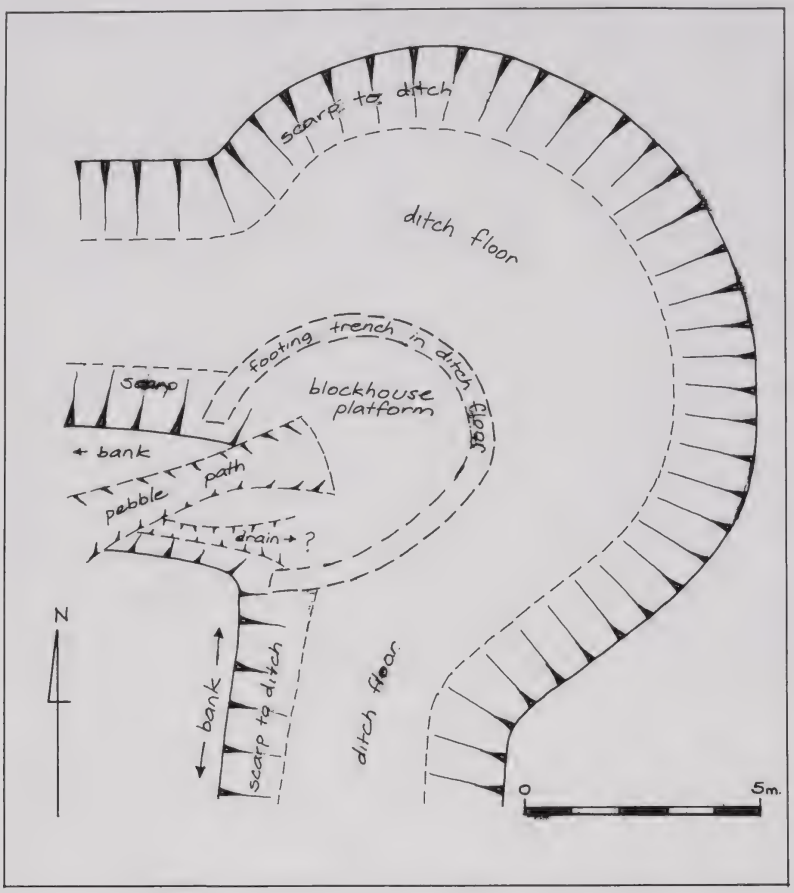


Fig. 20. Area IV: interpretation of the defences at the Queen's Redoubt north–east bastion, as revealed by excavation.

likely on the evidence, an earthwork bastion entered by the gravel path replaced the blockhouse shown in the 1863 illustrations. This has some confirmation from the lack of any building foundation holes cut into the path surface, and is shown on the 1864 perspective drawing (Fig. 11).

THE ARTEFACTS

With a single exception all artefacts are treated here as belonging to one collection, relating to the military occupation of Queen's Redoubt from June 1862 to mid-1867. A 20th century crown top 'ABC' quart beer was recovered from Area III, Layer 1. While it is recognised that other material may date from after the military occupation, there is nothing else that looks definitely to be out of place for an 1860s military site.

The material can be compared with other assemblages from military sites of the New Zealand Wars, notably Taranaki's Omata Stockade and Warea Redoubt (Prickett 1994), and the 40th Regiment Redoubt, Te Awamutu (Ritchie and Gumbley 1992).

Table 1. Queen's Redoubt excavated bottle and window glass (in grams).

AREAS	I	II	III	IV	TOTALS
'Black bottle' glass	3482.3	2182.7	1015.0	3622.9	10302.9
Green	1594.8	323.6	1717.8	177.2	3813.4
Aqua (pale green)	1900.9	391.0	193.6	242.3	2727.8
Case gin and schnapps	641.3	299.2		5.8	946.3
Colourless glass	414.2	286.1	74.0	40.5	814.8
Deep blue (castor oil)	321.0	54.2	144.3	61.0	580.5
Pale blue	405.5	63.7			469.2
Brown glass	228.5	26.7		5.8	261.0
Pink	19.2	9.4			28.6
Bright green		1.0			1.0
Window glass	74.4	82.9	11.8	17.7	186.8
TOTALS	9082.1	3720.5	3156.5	4173.2	20132.3

GLASS

As is usual in mid-19th New Zealand military sites, the most abundant bottle glass is from so-called 'black bottles', the glass actually being dark green in colour against the light. Olive Jones (1986: 9), who is responsible for the outstanding study of 'black bottles' for the period 1735–1850, states that they held wine, porter (a dark sweet beer brewed from black malt, popular in the 19th century), also other beers, cider, distilled liquors and other products. The Queen's Redoubt material has only one marked item, a base embossed with an eight-rayed star at the centre and 'W' nearer the margin. Quart 'black bottles' are in two diameter classes of *ca* 77 and *ca* 90 mm respectively (see Ritchie and Gumbley 1992: 35).

The second largest quantity of glass by weight is from green quart bottles. This includes ring sealed beer bottles and high 'kick-up' brandy bottles, which cannot always be distinguished in fragmentary material. At the Omata Stockade (Prickett 1994: 43) the latter bottles contained brandy in every case where the label has survived. Ritchie and Gumbley (1992: 40) picture some complete examples. An intact ring sealed beer was recovered in Area III, Level 1 (c. f. Ritchie and Gumbley 1992: 36). Case gin and schnapps bottles were made square (hence 'square gin') to fit economically into cases for export (Prickett 1994: 51–52). At Queen's Redoubt, schnapps is represented by the most common brand, Udolpho Wolfe's 'Aromatic Schnapps', from Schiedam, Holland. The only complete case gin top is of the tall style, not the so-called 'pig's snout' (c. f. Prickett 1994: Fig. 2.36B); a 55 mm square base is embossed with a 13-rayed star; other case gin bases are 65 mm square. Brown quart bottles such as contained German bitters at Omata (Prickett 1994: 50), are also represented at the Queen's Redoubt site.

Pale green ('aqua') glass includes many differently shaped bottles with a wide variety of contents, from large (quart size) cylindrical bottles, generally thought to have contained whisky (see Prickett 1994: 45; and Ritchie and Gumbley 1992: 41), salad oil bottles, pickle jars, small medicinal bottles, etc. Items of note include the base of a whisky bottle embossed 'LDN/ 664'. Salad oils included chevron patterned fragments (c. f. Prickett 1994: Fig. 2.32J) and a base embossed 'A/ C/ B/ Co' (c. f. Prickett 1994: Fig. 2.32L). Fragments of a Lea and Perrins Worcestershire Sauce bottle and an embossed Lea and Perrins glass stopper confirm the presence of the popular

condiment. Pickle bottles are fragments are embossed 'E. RIM. . .', or 'A' on the moulded base. A Hamilton patent ('torpedo') bottle fragment, embossed '. . .CK. . .' is probably from an Auckland manufacturer of aerated waters.

Dark blue glass comes from long-necked castor oil bottles, well represented at the Te Awamutu 40th Regiment redoubt site (Ritchie and Gumbley 1992: 49, 75). Pale blue glass includes pieces of a 59 mm square-sectioned bottle embossed 'R. . .' at the shoulder, and to the bottom of the bottle '. . .END' on one side and '. . .WS' on the other, also a small round bottle lightly embossed 'NEW YORK', and a small bottle of rectangular medicinal style.

Colourless glass includes fragments of a variety of containers and tableware. From the table comes a stemmed wine glass, and two handle fragments from a cup or small jug and from a large jug. Also represented are tumblers and cut glass from sugar bowls, vases, jugs or other such items. Where they can be positively identified containers are small bottles, some pieces apparently from items similar to 'capers' bottles at Te Awamutu (Ritchie and Gumbley 1992: 47). A small oval bottle is highly decorated with vertical bands of lines and dimpling and embossed 'GB 296' on the base; another small round bottle is embossed 'RO. . .' and '. . .BRIARS'.

Pink glass is from a small long-necked bottle. Dark green is a base piece also from a small bottle.

CERAMICS

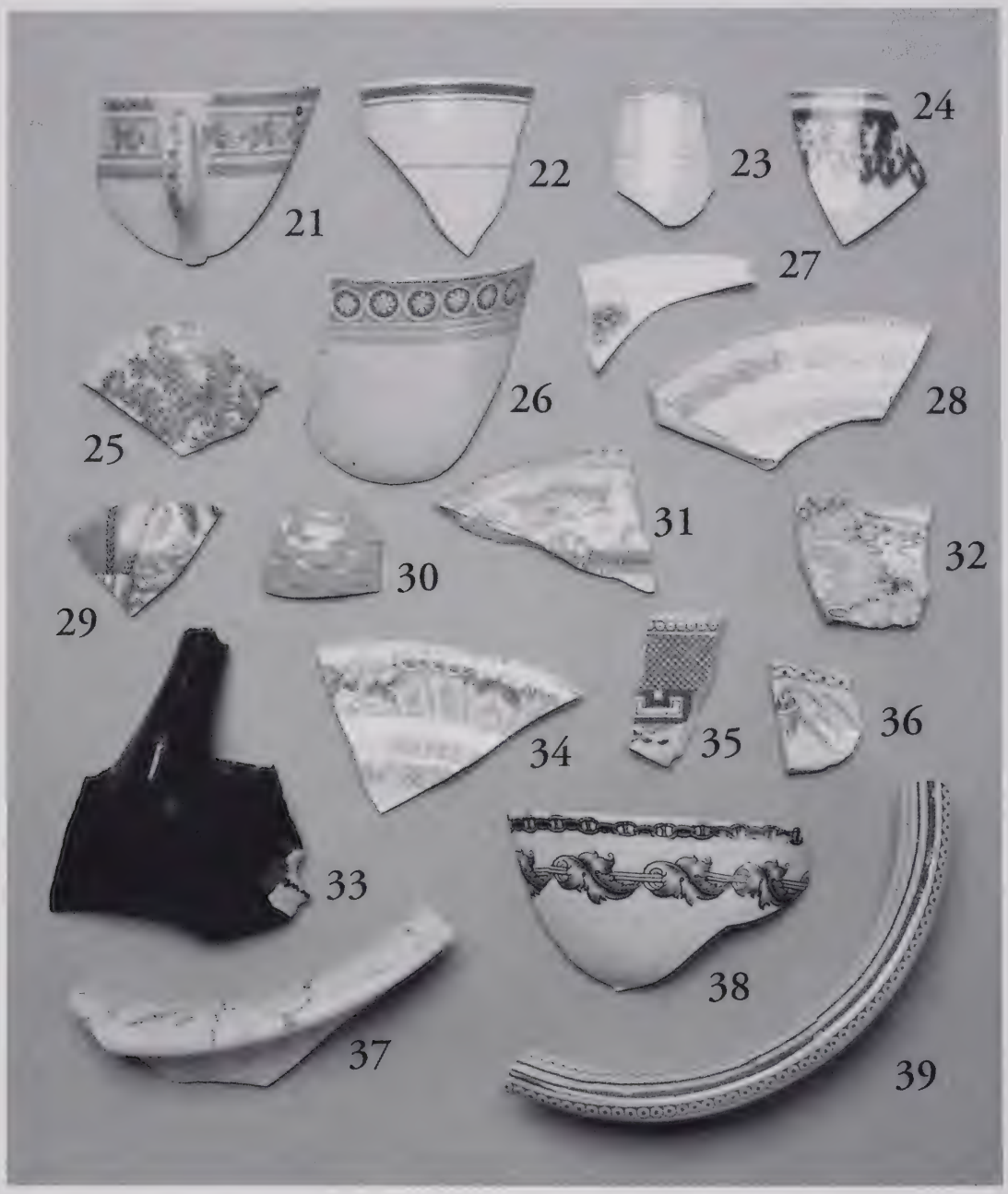
Among ceramics are stoneware, china and porcelain, all material but for a 'penny ink' in the form of broken pieces. Stoneware includes fragments of two large crocks *ca* 200 mm in diameter and 190 mm from the base to the shoulder, with off-white glaze on the body and a yellow/brown shoulder. The broken base of what may have been a ginger beer bottle of the same colours is 66 mm in diameter. The intact 'penny ink' is from the stone path in Area IV, with another piece found in Area III. There were also fragments of brown bottles or jars, 63, 70 and *ca* 80 mm in diameter. A near complete off-white flat top of an open-mouthed jar is 105 mm in maximum diameter, with the rim flange beneath indicating an internal diameter of the jar itself of *ca* 86 mm. The top and spout of a brown glaze ink bottle is similar to Doulton inks illustrated from Te Awamutu (Ritchie and Gumbley 1992: 114).

Two pieces of stoneware have makers' marks. A bottle with grey and white flecked glaze is stamped near the bottom 'REED(?) / LONDON'; it is *ca* 85 mm diameter and measures 150 mm to the sharply defined shoulder. A white glaze bottle or jar stamped 'DOULTON/ LAMBETH', *ca* 65 mm diameter, may have contained ink.

While not strictly stoneware, other product containers may be mentioned here. Pieces of white and cream glaze cylindrical cheese or meat paste pots are as illustrated from Warea Redoubt (Prickett 1994: 115). Also found were fragments of Holloway's ointment pots (see Prickett 1994: 55). A white glaze fragment may be from an insulator used in the military telegraph line, which reached Queen's Redoubt early in the 1863–64 campaign (see above).

China included fragments of a range of underglaze transfer printed and other wares typical of the period. A huge range of such material has been found in New Zealand historic sites, especially in urban sites such as His Majesty's Theatre, Auckland (Plowman 1998). Cups, bowls, dinner plates, saucers, chamber pots and a teapot and serving dish are represented among Queen's Redoubt material illustrated in Figures 21–39. It is mostly underglaze transfer printed ware, with some painted decoration, 'sponged ware', 'marbled ware' and pattern moulded wares.

Figure 21 is a blue transfer printed cup with a loop handle. Two other cup pieces have painted banding identical except for colour, red (Fig. 22) and pale blue (Fig. 23) respectively. Figure 24 is a cup piece of deep blue/purple sponged ware decorated inside and outside the rim.



Figs 21–39. Examples of underglaze transfer printed ceramics. Descriptions are in the text.

This was a cheap form of decoration used in the Staffordshire potteries in England in the 19th century (Savage and Newman 1985: 270). A brown transfer printed cup is shown in Figure 26, and Figure 30 is a pale blue cup of moulded woven pattern. Figure 25 is a bowl fragment of blue transfer print 'fibre' pattern. Another bowl, illustrated in Figure 27, is of sprigged ware porcelain

(Savage and Newman 1985: 271). Two other bowls are of black transfer print (Fig. 38) and brown transfer print including a scene with palm trees (Fig. 29).

Dinner plates are represented by purple underglaze transfer print (Fig. 34), grey transfer print 'Rhine' pattern (Fig. 32), and two of blue transfer print decoration (Figs 28 and 31). Figure 36 shows a blue decorated saucer. The well-known 'willow' pattern is represented by fragments including that of a heavy serving dish pictured in Figure 35. There is a brown glaze teapot (Fig. 33), and two chamber pots, with purple marbled ware (Savage and Newman 1985: 186; Fig. 37) and a green transfer printed linear border (Fig. 39) respectively.

CLAY PIPES

Fragments of clay tobacco pipes were found in all four excavated areas, although very little came from Area I (see Table 2).

Smoking was a popular activity in Queen Victoria's army, clay pipes being the preferred means for officers and men alike. It was only late in the 19th century that briar pipes came into common use, especially by wealthier individuals. Clay pipes made for a hot smoke, but were widely available and cheap. They were made until 1967 at the McDougall factory, Glasgow (Walker and Walker 1969: 32), although by then had long since been supplanted by cigarettes as the common form of tobacco smoking.

At Queen's Redoubt, the Glasgow firm of McDougall is represented by six stamped stems and one bowl piece stamped 'McDOUGALL/GLASGOW' in a shield. Other Glasgow makers, Thomas Davidson and Co., and A. Coghill, are each represented by a single stem piece. McDougall and Coghill were making pipes throughout the period Queen's Redoubt was occupied. The firm of Davidson began production after taking over the older Glasgow firm of Murray in 1861 or 1862 (see Prickett 1994: 65). The only other identified manufacturer is Thomas White, Edinburgh, represented by one stem fragment. Two stems are marked 'GLASGOW', but without a maker's name, and there is a 'TD' bowl fragment with spur. An embossed stem fragment is stamped '. . .ETS. . .'.

Table 2. Queen's Redoubt clay pipe material (in grams, 90 pieces—in brackets).

AREAS	I	II	III	IV	TOTALS
Complete bowls	–	–	–	29.9(2)	29.9
Decorated bowl pieces	–	1.7(1)	20.2(2)	9.6(6)	31.5
Plain bowl pieces	–	13.6(8)	3.8(2)	19.6(12)	37.0
Named/decorated stem pieces	–	9.0(5)	6.3(2)	20.5(7)	35.8
Plain stem pieces	4.1(2)	18.6(13)	13.6(7)	29.9(15)	66.2
Stem/ bowl pieces	–	3.1(1)	–	8.8(2)	11.9
Spurs	–	–	–	1.6(1)	1.6
Grips	–	0.9(1)	1.1(1)	–	2.0
TOTALS	4.1	46.9	45.0	119.9	215.9

The dominance of McDougall pipes in the small Queen's Redoubt group compares with the Omata Stockade, where 29 McDougall pieces make up half the total, with the remainder including 11 other manufacturers (Prickett 1994: 62). At the 40th Regiment redoubt, Te Awamutu, McDougall pipes were three of only five pieces identified as to maker (Ritchie and Gumbley

1992: 116). At Warea Redoubt, the common maker was Davidson, with 22 of 35 manufacturers' names (Prickett 1994: 116); there were also 11 McDougall and two Murray sherds. At the 1840s and early 50s Paremata Barracks near Wellington, 80% of 30 pieces identified as to maker came from the Glasgow firm of A. Coghill (Prickett 1981: 126).

Decorated items include a bowl/stem piece with what looks like an acorn embossed on it. There is a small fluted bowl fragment. At the end of clay pipe stems is a small 'grip' to enable the teeth to hold the pipe while smoking, two of which were found in the excavations. When these broke off, as often happened, the broken end of the remaining stem might be smoothed off for reuse, as occurred to one undecorated stem piece in the collection.

BUTTONS

Twenty-eight buttons were recovered, 14 of them from Area IV. British Army brass 'other ranks' uniform buttons include 13 of the 'large' *ca* 1 inch (25.4 mm) size, two 'small' buttons *ca* 3/4 inch (19 mm), and two 'cap' buttons, *ca* .6 of an inch (15.2 mm) in diameter (see Ripley 1971: 9). There is also an officers' gilt button, seven 'small chinas' and three metal trouser buttons.

In 1855 the British Army replaced the previous waist-length 'shell jacket' with a tunic for use by officers and men (see Ryan and Parham 2002: 29–31, 49–51), at the same time discarding the old pewter buttons long used by other ranks in favour of brass buttons of a new design in the three sizes outlined above (Ripley 1971: 7–9). Officers continued to use gilt buttons—to the new design. Other ranks used the new buttons until 1871, when a standard design showing the Royal Arms was adopted for all except a few specified corps. Officers wore the 1855 button until 1881. Rank and file buttons found at Queen's Redoubt are of the 1855–1871 style.

Of the 17 brass buttons, six are represented by backs only and two more are very fragmentary. Regiments represented are the 12th (four 'large' and one 'small' button), 14th (four 'large'), and 40th (one 'large'). Back marks which can be read are 'P. TAIT & Co/E&WS / PATENT/ LIMERICK' (three on 12th and 14th Regiments buttons), and one each of 'FIRMINS / LONDON' and 'SMITH, KEMP & WRIGHT / BIRMINGHAM' (both of them backs only).

A 22 mm diameter Royal Artillery gilt officers' button appears to fall between the standard 'small' and 'large' sizes as defined by Ripley. As much of the back mark as can be made out may be '. . .ENNENS & Co / LONDON'.

'Small china' buttons were stamped out of dry clay by a process developed about 1840 by Richard Prosser of Birmingham (see Prickett 1994: 69). At Queen's Redoubt they fall into two groups, *ca* 8 mm and 10.5–11 mm in diameter (and may be compared with Type 1A and C in Prickett 1994: 71). Buttons like this were used on underwear. Larger one-piece buttons, stamped from a thin brass or iron sheet are usually referred to as 'trouser buttons', although may also have been used on shirts and other garments. The three found at Queen's Redoubt are 17 (two buttons) and 15 mm diameter. The smaller one is a simple shallow dish with four holes and no makers mark; details of the larger two are obscured by rusted iron.

FIREARMS

Three items relating to firearms are a .577 inch (14.7 mm) calibre bullet and percussion cap, both belonging to the Enfield rifled musket, and a fragment of flint from a flintlock firearm. The Enfield Pattern 1853 was the standard infantry weapon of the British Army from the Crimean War to 1866, when the Snider breech-loading Enfield conversion was adopted and progressively issued to line regiments (see Pegler 1998). The percussion cap is of the so-called 'top-hat' style, as illustrated by Pegler (1998: 80).

Since the British Army had ceased to use flintlock weapons in the 1840s, the question arises—

why is there a gun-flint at Queen's Redoubt? The answer may lie in the sporting nature of British officers, for whom duck shooting was a popular occupation (see for example Lennard 1986: 22–23). Sporting shooters can be very conservative, preferring the old and favoured over modern weapons. Another possibility is that the gun-flint is a souvenir of fighting in the district, since Maori are known to have made use of flintlock weapons in the Waikato War.

MISCELLANEOUS IRON AND OTHER METAL ITEMS

Iron items were all highly rusted, and in some cases too obscured or degraded for identification. Relating to buildings or other structures are a few cut and wire nails and staples. Doors or gates are represented by a bolt, several door hinges and a door knob, and three or more large strap hinges, all in poor condition. There was a heavily rivetted fragment of what might have been a ship's tank, a 100 mm long heavy-duty iron hook and part of a *ca* 300 mm diameter iron frying pan. Other materials include a small piece of lead sheeting—likely to be flashing from a corrugated iron roof, short lengths of copper wire and a 10 mm long bass screw.

A heavy-duty axle hub from Area I is 240 mm long. Increasing in diameter from 70 to 80 mm, with flanges at the larger end, presumably designed to hold the wheel in place, this item clearly is designed to carry a considerable weight and may be from a gun carriage or ammunition cart. Also relating to horse-drawn transport is a hame—one of two attached to the collars of draught animals for holding harness traces. There are iron harness buckles and fragments of copper-rivetted heavy leather. Two horseshoes include one from the Area IV path.

A small double-bladed pocket knife, 75 mm x 12 mm, was held together by a brass frame, with a rivetted wooden handle finished off with brass fittings at both ends. A larger pocket-knife, also double bladed, was 87 x 15 mm with a rivetted wooden handle with brass at the hinge end only.

OTHER ITEMS

A few fragments of faunal material are made up of three horse teeth, a cattle cervical vertebra and a possible horse cervical vertebra bone, and four pieces of cockleshell. Red-orange and grey-white brick pieces were recovered, in small quantities apparently scattered from demolished structures.

DISCUSSION

Queen's Redoubt was a major military fortification and camp, which probably had more British troops and colonial forces stationed there or passing through than any other European fieldwork of the New Zealand Wars. The accommodation for 450 men in huts within the earthwork defences is far in excess of other European military posts. There was also an extensive camp of tents and huts outside the fort, especially in 1863 when there was a build-up of troops early in the Waikato campaign.

The importance of the fortification is shown by the size of its defended area, at 8360 m^2 (100 x 100 yards), eight times that of a standard one-company campaign redoubt in New Zealand and more than five times larger than a two-company redoubt. Excavations show the ditch to have been dug probably to ordered dimensions of 8 feet (2.4 m) depth, 7 1/2–8 feet (*ca* 2.3–2.4 m) across the bottom and 15–16 feet (*ca* 4.5–4.8 m) across the top. Again, this is hugely bigger than the standard redoubt in New Zealand of 6 feet (1.8 m) depth and 8 feet (2.4 m) across at ground level.

Evidence of huts was found in the form of mostly shallow holes for foundation posts. Parts of two buildings were found, one of which was probably 5.5 m wide and of an unknown length. The 5.5 m conforms to a standard 18 feet 6 inches hut width, as given in the March 1867 sale advertisement (see above). A variety of lengths for such huts also can be established from the advertisement.

Artefactual finds are similar to those of other excavated mid-19th century New Zealand military sites. Glass is generally from bottles containing alcohol. Ceramic items are mostly 19th century underglaze transfer print material. Clay pipe pieces that can be identified are all from Scottish makers, dominated by the Glasgow firm of McDougall. The most common type of button is the brass 'other ranks' military button, in this case of the 12th, 14th and 40th regiments. There is also a Royal Artillery gilt officers' button. Other buttons are 'small chinas' from underwear, and iron trouser buttons. Among iron and other metal material are locks and hinges—presumably from demolished buildings or gates. Relating to transport are a heavy-duty axle hub, harness hame, harness buckles and leather, and two horseshoes.

The Queen's Redoubt excavation reported here took place more than ten years ago. Since then there have been considerable changes in regards to the archaeological study of New Zealand War sites. The Queen's Redoubt site itself has been purchased by the Queen's Redoubt Trust, which plans to carry out a series of excavations in order to progressively describe the historic site and interpret for the public the place and the part of New Zealand history in which it played so important a role.

Assemblages from military sites now have a wider context of material culture studies. Urban excavations undertaken as mitigation exercises have rapidly increased knowledge of 19th century material culture in New Zealand, most significantly of glassware and ceramics which makes up the bulk of every assemblage. At the same time there has been development overseas in the study of 19th century material culture (see for example, Brauner 2000). The worldwide dispersal of the products of northern hemisphere industry means that 19th century assemblages in North America, and Australia and elsewhere will be similar to those recovered in New Zealand.

Archaeology has the potential to throw considerable light on the course of the New Zealand Wars, on the strategies and tactics of the two sides, on technological, economic, social and political aspects of the struggle, and on political outcomes of the military conflict. The campaigns were fought and decided in the field, where archaeology is uniquely able to describe and interpret the evidence. The course and outcome of the New Zealand Wars were crucial in New Zealand history. In a long struggle fought out almost entirely at fortified positions, and in which the strategic use of fortifications was critical in the final outcome, Queen's Redoubt was one of the most important fortification put up by either side.

With regard to archaeological study of the New Zealand Wars, a major current issue is the rapid loss of important sites as a result of land development and changes in land use. Sites are being lost without any investigation far more quickly than any research or excavation programme can be carried out. Often there is no prior knowledge of destruction, administration of the Resource Management Act signally failing in respect of archaeological sites. The excavation of more New Zealand War sites is a matter of urgency for improved historical and archaeological knowledge of a critical part of our history.

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was made possible by a willing team of volunteers who turned out at short notice. Joan Lawrence sorted and catalogued the finds.

Fenella Barton provided me with a copy of Colonel Gamble's 1862 sketch map of the Great South Road, held at the Public Record Office, London. Janice Fraser and Hans Bader assisted in identifying ceramic material. Brian Gill identified animal bone. Drawings are the work of Caroline Phillips and Kate Hill.

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HISTORICAL MOA BONE COLLECTIONS (AVES: DINORNITHIFORMES) AT AUCKLAND MUSEUM—CLEVEDON AND KIA ORA

B.J. GILL

Abstract. Auckland War Memorial Museum houses moa bones collected from swamp sites at Clevedon, South Auckland, in 1912, and at Kia Ora, North Otago, in 1930. Background to the discovery and excavation of these sites, gleaned from archival documents, is given, with an inventory of Auckland Museum's current holdings of specimens from these sites. The Clevedon collection comprises 280 bones belonging to at least 19 individual moas (16 *Anomalopteryx didiformis*, two *Pachyornis mappini* and one *Dinornis struthoides*) typical of a North Island wet forest site. The Kia Ora collection comprises 332 bones belonging to at least 51 individuals (17 *Emeus crassus*, 12 *Euryapteryx geranoides*, five *D. struthoides*, three *P. elephantopus*, one *D. giganteus* and 13 unidentified individuals). Documents have also established that the moa egg described by Gill & Cooper (2001) was found at Cromwell, Otago, before 1912.

KEYWORDS: Bird; ratite; Dinornithiformes; Holocene fossils; bones; New Zealand; South Auckland; Otago.

INTRODUCTION

Auckland War Memorial Museum has a collection of about 820 registered lots of moa bones (Aves: Dinornithiformes). Much of the collection was acquired by Sir Gilbert (G.E.) Archey, who was the museum's Director from 1924 to 1964, and who collected and studied moa bones in the 1930s as a basis for his monograph on moas (Archey 1941). At this time Archey obtained moa bone collections from Waikaremoana, the Waitomo area (King Country), Tokerau Beach (Northland), Mt Arthur (Nelson) and, it seems, Kia Ora (North Otago). However, the museum also has moa bone collections obtained earlier during T.F. Cheeseman's period as "Curator" (Director) from 1874 to 1923. These include collections from Whangarei (Northland) and Clevedon (South Auckland).

Most of these collections from particular sites were not described in detail at the time of discovery, nor have many of them been fully described since. Many of the older collections are poorly documented in the Land Vertebrates Department as to their precise localities and the circumstances of their collecting. I have therefore searched for correspondence and other documents in the archives of the Auckland Museum Library that cast further light on these moa collections. The purpose of this paper is to provide details of the fossil sites at Clevedon and Kia Ora, and to list the fossil bones identified in the Auckland Museum collection as being from these swamp sites. I have also obtained further documentation on the moa egg described by Gill & Cooper (2001).

In the inventories of the Clevedon and Kia Ora collections given in this paper, the total number of bones in each registered lot (x), and the minimum number of individuals represented by those bones (y) are given by the expression x/y. For each species, the x numbers for the individual lots are additive, but the y values are not. This is because the bones were presumably all found together in these swamp sites and the division of bones of the same species into lots is sometimes arbitrary (e.g. separation according to bone element) rather than according to individual birds. Values of y have been separately computed with all specimens of the species pooled.

The total length (mm) of undamaged leg bones is given. I measured lengths in an osteometric device (Archey 1941: 14, text-fig. 1) with the shaft of the bone parallel to the ruler. The length characters used here were those illustrated by Worthy (1987: 63, fig. 4), and the length of the tibiotarsus includes the cnemial crest. The presence of bones with signs of immaturity is noted.

NUMBERING OF MOAS AT AUCKLAND MUSEUM

It is uncertain whether and how early moa bones were registered at Auckland Museum. There are only five moa entries in the "Blue Book", which covers land vertebrates received up to 1917 (see Gill (1984, 1999) for further details of the departmental numbering systems). These entries are not for loose bones but for a "restoration", two articulated skeletons and two slabs with footprints. At least some moa bones received AV numbers under the card-cataloguing system for birds that was begun c. 1925. Others may have lost any record of an AV number when they were renumbered under later systems.

The main registration system for moa bones was the "Moa Record", an excercise book listing collecting details for moa bones that were given simple consecutive numbers starting at 1 (the first entry is actually for number 2). The entries to number 455 are in an unknown hand, followed by 456–468 in Archey's hand-writing, and 469–487 entered later by other staff members. This register was presumably used by Archey during his research on moas in the 1930s, and the numbers are those cited for Auckland Museum specimens in Archey's monograph (1941).

In 1966–67, L.J. Wagener reorganised the moa collection and renumbered the specimens with a species numbering system similar to the AV system used for other birds. Specimens were given numbers like 3.24 for the 24th specimen of moa species number 3. Duplicate 5 x 3 inch cards were filled out, one to be filed numerically and the other alphabetically by Latin name.

In 1983–84 the species numbering systems were abandoned. Birds, including moas, were renumbered with a simple consecutive number, often cited (as below) with the prefix B (for birds). During the renumbering of the moa bones in 1993–95, when all bones were checked and cleaned, lots were split into smaller units where this was warranted (e.g. separating immature bones from adult ones).

CLEVEDON, SOUTH AUCKLAND, 1912

The Clevedon site was discovered by a farmer (T.L. Smith) on his land and reported to a local amateur naturalist (H.S. Munro). Details are contained in:

(1) A letter to Cheeseman from H.S. Munro dated 17 September 1912 (Auckland Museum Library MA 95/41/4, AV2.4.17).

(2) A report in the *New Zealand Herald* of 25 September 1912 (p. 8) after a visit by Cheeseman to the site.

(3) An account that Munro wrote from memory in June 1946 ("Discovery of moa bones"; single-page typescript in Auckland Museum Land Vertebrates Department file).

The Clevedon discovery was discussed briefly by Buick (1931: 159) and Oliver (1949: 14, 29), probably based largely on the *N.Z. Herald*, and perhaps other, newspaper accounts. Bones from Clevedon were not mentioned in Archey's monograph (1941), perhaps in part because the bones were not then at Auckland Museum, but also because Archey paid most attention to sites that yielded associated bones of individual moas which the Clevedon site did not. Millener (1981) mentioned the site and its moa fauna briefly, as did Anderson (1989: 52, 214).

Hugh Sutherland Munro lived at Clevedon South when the bones were discovered, but by 1946 was living at Papakura. He was a brother of George Campbell Munro (1866–1963), who emigrated to Hawaii in 1890 where he became Honorary Associate in ornithology at the Bishop Museum, and wrote *Birds of Hawaii* (1944). H.S. Munro was also an uncle of H.R. McKenzie, who was part-time Associate Ornithologist at Auckland Museum, 1968–1972.

LOCATION

The site was "in the Clevedon district" (MA 95/41/4) and described as "a rich flat at the foot of a range of hills" (*N.Z. Herald*). Munro later gave the locality as "the foot of a range of hills, running from Maraetai to Papakura Valley" (1946 MS). The site cannot therefore be fixed precisely, but was clearly at the foot of the hills north, west or north-west of Clevedon. Clevedon was Site 99 of Millener (1981), who gave grid references R11/899656 and N42/530432, and listed it as having the Fossil Record Number R11/f28 (Geological Society of New Zealand).

DISCOVERY

"While draining & stumping a piece of swampy land [in July 1912] Mr T.L. Smith struck a layer of bones some four feet [1.2 m] from the surface & directly under the spot from which a three foot [0.9 m] white pine stump [*Dacrycarpus dacrydioides*] had been removed" (MA 95/41/4). Munro was not informed until some two months after the discovery, when he spent two days excavating bones. The bones were "in a heap", intermixed with timber and "great quantities of stones of hinau [*Elaeocarpus dentatus*], miro [*Prumnopitys furruginea*] & parts of karaka berries [*Corynocarpus laevigatus*]" (MA 95/41/4). Munro thought it probably a Maori midden site. According to the *N.Z. Herald*, the farmer found the bones "within an area of some few square yards" while attempting to drain one of the natural springs in the area.

Munro's 1946 MS indicates that he took the bones to his home, 4 miles (6 km) from the site, where he washed them and spread them out to dry. When dry they were "sized with glue". Some articulated skeletons were set up (Fig. 1).

An incomplete series of letters in the archive of the National Museum of New Zealand, Wellington, shows that Munro and Smith considered selling the moa bones overseas, and in 1917 offered them for sale to the museum in Wellington. However, the museum's offer, constrained by "the necessity for war economy", was "a bit less" than the collectors' idea of their value. In 1926 it appears that Munro was seeking £2,000 for the collection. The Director of the Wellington museum advised the Under-Secretary for Internal Affairs that the collection was "doubtfully worth £100", and recommended that no permit to export be given.

It seems that in 1946 Munro still had the collection, or part of it, at his home. The bones probably came to Auckland Museum later, perhaps in 1954 with other bird specimens collected by G.C. and H.S. Munro.

MOA FAUNA

In his 1912 letter (MA 95/41/4), Munro estimated the excavations to have yielded "upwards of forty birds varying in size from about one to nine feet [0.3–2.7 m] in height". The bones

Fig. 1. Moa bones from the Clevedon site. Undated photograph of articulated skeletons and loose bones, apparently at the home of H.S. Munro in Papakura. The large skeleton (*Dinornis*) is not among the Clevedon bones currently recognised at Auckland Museum. Photo: Dr G. de Clive-Lowe (Auckland Museum Land Vertebrates Department).

were "considerably damaged, both during the draining & afterwards by cattle".

Cheeseman, probably after further excavations, identified the bones as comprising 26 *Dinornis* (= *Anomalopteryx*) *didiformis*, 6 *D.* (= *Euryapteryx*) *curtus*, 1 *D. gracilis* (= *D. novaezealandiae*) and 1 *D. oweni* (= *Anomalopteryx didiformis* or *Pachyornis mappini*), making a total of 34 birds (*N.Z. Herald*). The large skeleton shown in Fig. 1 is probably the single specimen referred to *Dinornis gracilis*. According to the *N.Z. Herald* account, the deposit also contained gizzard stones, the largest stone weighing about 2 ounces (57 g), and tracheal rings. Oliver (1949: 14) stated that the site yielded about 900 bones representing 40–50 birds.

P.R. Millener examined the collection at Auckland Museum in 1978, and summarised the species composition (with minimum numbers of individuals) as: 20 *Anomalopteryx didformis*, 10 *Euryapteryx curtus*, 2 *Pachyornis mappini* and 1 *Dinornis struthoides* (Millener 1981: 800). Labels in Millener's hand identified particular bones (now numbered B7122–3) as *Pachyornis septentrionalis*, which is currently a synonym of *P. mappini* (Turbott 1990). I have identified

further Clevedon bones (now numbered B11079–81) as belonging, or possibly belonging, to this species. Distinctive features of *P. mappini*, compared with *Anomalopteryx didiformis*, include a more dorso-ventrally flattened pelvis and the presence of a pneumatic foramen at the proximal end of the femur on the ventral surface (Worthy & Holdaway 2002).

I identified three bones as belonging to *Dinornis struthoides* (now numbered B11078). All remaining bones from the site are listed as *Anomalopteryx didiformis*. I have checked the lengths of intact leg bones to make sure they fall within the established range for *A. didiformis*. All the femurs lack the pneumatic foramen of *P. mappini*, and none of the pelves are dorso-ventrally flattened. However, other bones like the tibiotarsus and tarsometatarsus are hard to identify, especially when damaged. Minor bones like vertebrae, phalanges and ribs have not been checked, or are impossible to check, for species identification.

L. Huynen (Massey University, Auckland) amplified DNA from a small sample drilled from a femur of both B7122 and B7123 (attributed to *Pachyornis mappini*), and found the DNA sequences to be similar to those of bones identified as *P. mappini* from other sites (D. Lambert and L. Huynen, pers. comm. 2003). The bones of *Euryapteryx curtus* that Millener identified are either missing, or among the bones ascribed to *A. didiformis*.

INVENTORY OF SPECIMENS

Bones in Auckland Museum believed to be from the 1912 Clevedon site are currently registered in the 13 lots listed below. They are catalogued from Clevedon, Papakura or without locality, and with or without the name H.S. Munro, G.C. Munro or just "Munro". Nearly all the bones are stained a distinctive reddish brown, which is consistent with them all having come from the same swamp site.

In total, 280 bones from Clevedon are recognisable in the Auckland Museum collection, representing a minimum of 19 individual moas. Summary statistics for the largest samples of bone lengths are given in Table 1.

Anomalopteryx didiformis (Owen, 1844)

(264/16; minimum number of individuals based on a total of 16L tarsometatarsi)

B5841 (formerly 1.146; x/y = 49/9). 22 vertebrae; 7 thoracic ribs; sternum (partial); pelvic fragment; L tibiotarsus (shaft only, immature); 4L+9R fibulas; 4L tarsometatarsi (all damaged).

B5842 (formerly 1.160; 7/3). R femur; 3R tarsometatarsi; 3 phalanges. Immature; all long bones damaged.

B5843 (formerly 1.160; 153/9). 7 crania; 16 mandibles or mandibular fragments (minimum number of individuals = 9); 3 quadrates; tracheal ring; 2 thoracic vertebrae; 2 thoracic ribs; 2 pelves; L+R femurs (233 mm); 2L+3R tibiotarsi (all damaged); L+R fibulas; L+3R tarsometatarsi (159, 163, 168 mm); 92 non-ungual phalanges; 15 ungual phalanges. Remains of seeds of *Elaeocarpus dentatus* (hinau), *Prumnopitys ferruginea* (miro) and *P. taxifolia* (matai).

B5857 (formerly 1.148; 13/8). 5L+8R femurs (216, 235, 235, 244, 244, 246, 246, 248 mm plus 2 immature).

B5858 (formerly 1.148; 13/8). 5L+8R tibiotarsi (340, 374, 378, 380, 383, 404 mm).

B5859 (formerly 1.148; 17/7). 10L+7R tarsometatarsi (167, 168, 168, 174, 175, 177, 177, 177, 180, 182, 206, 207 mm plus 2 immature).

B5867 (former number not recorded; 12/3). 3L+3R femurs (all damaged or immature); 3L+2R tibiotarsi (370 mm, most damaged); L tarsometatarsus (177 mm).

Pachyornis mappini Archey, 1941
(10/2)

B7122 (former number not recorded; 8/1). Cranium; vertebra; pelvis; L+R femurs (150 mm); L tibiotarsus (246 mm); L+R tarsometatarsi (119 mm). Presumably associated bones of individual.

B7123 (former number not recorded; 1/1). L femur (164 mm).

B11081 (formerly 1.160; 1/1). Pelvis.

Pachyornis mappini?
(3/1)

B11079 (2/1). L+R tibiotarsi (288 mm). The bones seem to be a pair but one was formerly numbered 1.148 and the other 1.160.

B11080 (formerly 1.160; 1/1). Cranium.

Dinornis struthoides Owen, 1844
(3/1)

B11078 (formerly 1.148; 3/1). L+R femurs (249 mm), tarsometatarsus (shaft only). Immature.

Table 1. Summary statistics for bone lengths (mm) of moas from the Clevedon and Kia Ora swamp sites. Samples of five or greater only.

Element	mean	n	s.d.	range
CLEVEDON				
Anomalopteryx didiformis				
Femur	238.6	9	10.15	216–248
Tibiotarsus	375.6	7	19.10	340–404
Tarsometatarsus	176.6	16	13.29	159–207
KIA ORA				
Emeus crassus				
Femur	272.0	20	22.44	236–307
Tibiotarsus	456.7	17	37.99	387–512
Tarsometatarsus	208.2	25	20.06	177–242
Euryapteryx geranoides				
Femur	275.1	14	24.63	242–309
Tibiotarsus	475.5	16	45.41	397–531
Tarsometatarsus	209.1	12	12.39	186–221
Dinornis struthoides				
Tarsometatarsus	314.6	5	11.48	304–334

AGE

A bone collagen sample from specimen 1.160 (now B5843) was carbon-14 dated at 1315 ± 70 years BP (NZ4871C; Millener 1981: 482, 848). Records from the Institute of Geological and Nuclear Sciences (Lower Hutt, New Zealand) show that a right femur was dated, that the Conventional Radiocarbon Age was determined on the "new oxalic acid standard" and that the bone had 6.6% organic carbon (T.H. Worthy, pers. comm. 2003). This confirms the site as a natural late Holocene swamp-miring site unconnected with human activity.

KIA ORA, NORTH OTAGO, 1930

Auckland Museum has a collection of moa bones labelled from Kia Ora, which are not further documented by the cataloguing system and had to be listed by Worthy (1998: 507) as being without a collector or precise locality. A group of letters from 1930 (Auckland Museum Library MA 95/43/21, AV2.6.489) exchanged between Archey and Mr K.L. Warren, then a divinity student at Knox College, Dunedin, seems to provide a key to the missing information. Mr Warren discovered moa bones at a site 9 miles (14 km) west of Oamaru, which is clearly the Kia Ora area. The correspondence states that the bones were received by the museum. Auckland Museum has no other large assemblage of moa bones from Otago, so presumably the 1930 correspondence and the Kia Ora bones belong together, though there is no direct link.

"Beck's farm" is given on labels as a location for three specimens (B6091, B6178, B11083), but this name does not appear in the correspondence. The farm where the bones were found changed hands in 1930 but the correspondence gives neither the old nor new owner's name. Warren's contact address while digging was c/o Mr William Freeman of Kia Ora, but this may not have been the farm containing the site.

Oliver (1949) made no mention of the Kia Ora site, and Archey (1941) mentioned it only once (p. 51; as a locality for *Emeus crassus*). T.H. Worthy examined the collection in 1991 and published a summary of its contents (Worthy 1998: 507).

LOCATION

Warren's correspondence states that the moa bones were from a bog on a farm 3½ miles (6 km) from Five Forks, 4 miles (6 km) from Enfield and 9 miles (14 km) west of Oamaru. This agrees with the site being at Kia Ora. In a short report, with map (Fig. 2), Warren described the site as being on the fringe of the limestone district. The site, at about 300 feet (90 m) above sea-level, was in a small natural catchment c. 1000 yards (900 m) by 600 yards (550 m). It was bounded to the north-west, south-west and south-east by low hills to 1200 feet (370 m). The site, "in a soakage area", was "easily flooded, with no natural outlet for water except [a] series of bogs and water-holes which dry up in summer". The Kakanui River was 3½ miles (6 km) west in a neighbouring watershed.

Unfortunately, some of these locational details are puzzling. Kia Ora is east of the Kakanui River, on a flat with surrounding low hills, none of which exceed 150 m. Despite the written and sketched details it is still not possible to place the site exactly on a modern map. The valley in question had a road through it (Fig. 2), and one possible valley with a road, is at grid reference 375707 (NZMS260 J41; T.H. Worthy, pers. comm. 2003). It is even possible that the Kia Ora site and the one called "Five Forks" (Worthy 1998: 503) are the same, since the grid reference given for the latter is the bed of a stream and cannot be correct (T.H. Worthy, pers. comm. 2003). The two sites are clearly close by, if not the same. The Kia Ora site has the Geological Society of New Zealand Fossil Record Number J41/f251 (Worthy 1998) .

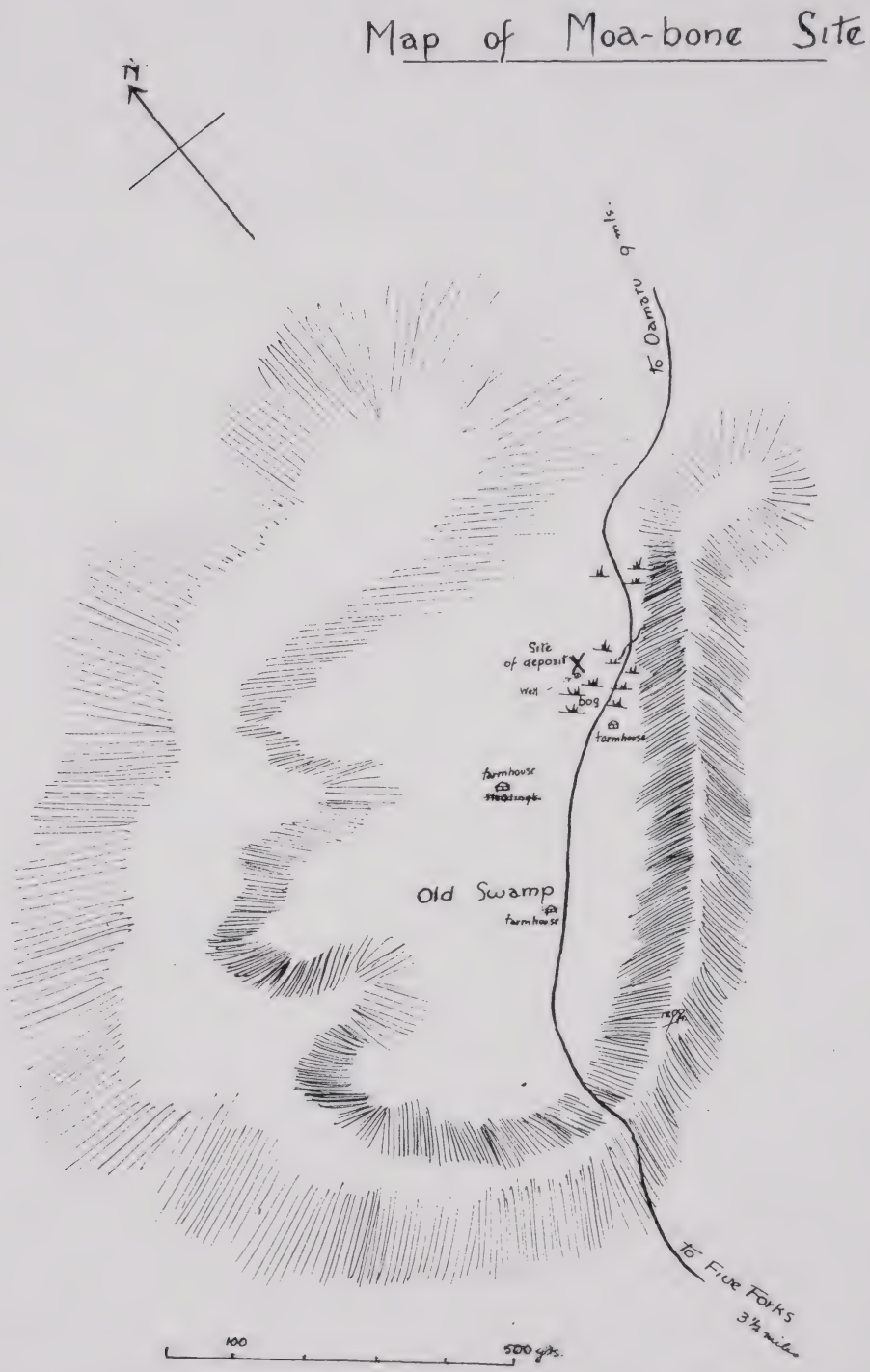

Fig. 2. Sketch map by K.L. Warren, 1930, showing the location of the Kia Ora moa bone site (Auckland Museum Library MA 95/43/21, AV2.6.489).

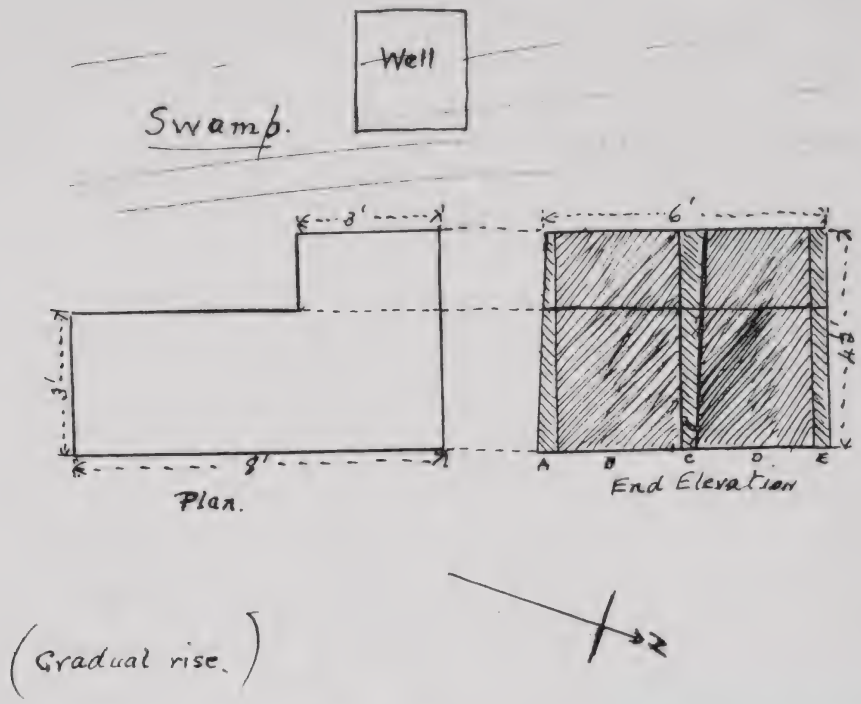

Fig. 3. Diagram by K.L. Warren, 1930, showing his excavation at Kia Ora (Auckland Museum Library MA 95/43/21, AV2.6.489).

DISCOVERY

Warren first recovered bones from the site in April 1930, accompanied by Mr Skinner of Otago Museum. Warren gave some bones to the farmer, and to Otago Museum, but the museum declined further involvement and referred him to Auckland Museum. Archey offered Warren remuneration of £6 per week to dig bones for a fortnight during the college vacation in September, plus expenses in packing and forwarding the bones to Auckland. Archey visited the site for one day in September (probably on the 5th), and presumably gave directions for the excavation. The dig took place during the first fortnight in September but was cut short when rain flooded the hole. Warren felt he obtained a representative collection, but that he "touched only the fringe of the deposit".

Warren's diagram (Fig. 3), shows that he excavated an area of about 28.5 square feet (2.7 m^2) to a depth of 6 feet (1.8 m). He identified the following five strata (Fig. 3):

Layer (A): Surface clay and soil, 4–9 inches (100–230 mm) deep.

Layer (B): "Peat clay", 3 feet (910 mm) deep. No bones but "fresh-water mussels and minute shells".

Layer (C): Ash and charcoal, 4–6 inches (100–150 mm) deep. Bones poorly preserved and mostly broken.

Layer (D): "Blue-pug clay", 2 feet (610 mm) deep. Bones in good condition; also timber, mussels, stone, water-worn shingle.

Layer (E): Black sandy silt; depth unknown. Bones poorly preserved but whole.

After the second excavation, the moa bones were washed and sent to Auckland by coastal

steamer from Oamaru. When received by the museum on 1 October, the bones were placed in a skylight to dry out.

MOA FAUNA

At the first dig, in April 1930, Warren recovered leg and toe bones, vertebrae, ribs, three skulls and chick bones, all indicative of "many species and ages". When the final collection was received, Archey identified most of the bones as belonging to *Pachyornis elephantopus*, *Emeus crassus*, *Emeus huttonii* (= *E. crassus*) and *Euryapteryx gravis* (= *Eu. geranoides*), with a few assigned to *Anomalopteryx didiformis* and species of *Dinornis* (Auckland Museum register "Moa Record"). T.H. Worthy checked the identity of nearly all the Kia Ora specimens and attributed most to *Emeus crassus* and *Euryapteryx geranoides*, and a few to *Pachyornis elephantopus*, *Dinornis struthoides* and possibly *D. giganteus* (Worthy 1998: 507).

The inventory below largely follows Worthy's determinations. A very large mandibular fragment (formerly 441; now B11083) matches a reference specimen of *D. giganteus* and I have assigned it to that species. A long but very slender tarsometatarsus of a chick (formerly 416) I have identified as *Dinornis struthoides* and re-numbered B11082.

L. Huynen (Massey University, Auckland) amplified DNA from a small sample drilled from each of three femurs of *Emeus crassus* (B6106). Initial results have confirmed a right femur 282 mm long as belonging to *E. crassus*, but the other two femurs (264 and 284 mm long) have DNA sequences that group them with specimens of *Euryapteryx geranoides* (D. Lambert and L. Huynen, pers. comm. 2003).

M. Bunce (Oxford University, U.K.) amplified DNA from a sample taken from each of two tibiotarsi of *Euryapteryx geranoides* (B6138 and B6237), and found the DNA sequences to confirm that identification (M. Bunce, pers. comm. 2003).

INVENTORY OF SPECIMENS

Bones in Auckland Museum believed to be from the 1930 Kia Ora site are currently registered in the 50 lots listed below. They are mostly catalogued from Kia Ora without further details (except for three lots labelled from "Beck's farm"). Some of the bones are pale, but most are stained brown or black, which is consistent with a swamp origin. B6799 and B6800 (both tibiotarsi of *Dinornis struthoides* labelled "North Otago") are assumed to be from the Kia Ora collection because B6800 and B6785 (from Kia Ora) seem to be a pair, matching exactly in size, shape, colour and wear.

In total, 332 bones from Kia Ora are recognisable in the Auckland Museum collection, representing a minimum of 51 individual moas. Table 1 gives summary statistics for the largest samples of leg-bone measurements.

Pachyornis elephantopus (Owen, 1856)

(8/3; minimum number of individuals based on the three sizes of tarsometatarsi)

B5940 (formerly 283; x/y = 1/1). L tibiotarsus (467 mm).

B5980 (formerly 422; 1/1). L femur (315 mm).

B5981 (formerly 422; 1/1). L femur (304 mm).

B5982 (formerly 422; 1/1). R tarsometatarsus (250 mm).

B5983 (formerly 422; 1/1). L tarsometatarsus (215 mm).

B5984 (formerly 422; 1/1). R tarsometatarsus (214 mm).

B5985 (formerly 422; 1/1). L tarsometatarsus (210 mm).

B6239 (formerly 285; 1/1). R tibiotarsus (540 mm).

Emeus crassus (Owen, 1846)

(97/17; minimum number of individuals based on 17L femurs)

B6091 (formerly 442; 11/4). 2 crania; 3 premaxillas; 4 mandibles (some partial); 2 quadrates.

B6101 (formerly 422; 1/1). R tarsometatarsus (227 mm).

B6106 (formerly 415; 13/7). 6L+7R femurs (237, 255, 261, 264*, 271, 280, 282, 282, 284*, 287, 289 mm). One immature. *DNA analysis suggests that these two femurs belong to *Euryapteryx geranoides* (D. Lambert and L. Huynen, pers. comm. 2003).

B6107 (formerly 415; 17/9). 8L+9R tibiotarsi (413, 424, 431, 432, 448, 471, 471, 476, 478, 480, 485, 486, 501 mm).

B6130 (formerly 415; 16/10). 10L+6R tarsometatarsi (184, 202, 208, 208, 212, 217, 221, 222, 223, 228, 229, 232, 233, 234, 242 mm). One immature.

B6131 (formerly 416; 4/2). 2L+2R tibiotarsi (387, 387 mm). Two immature.

B6132 (formerly 416; 14/9). 9L+5R femurs (203, 236, 241, 243, 245, 247, 248 mm). Five immature.

B6133 (formerly 416; 8/6). 2L+6R tarsometatarsi (143, 158, 177, 185, 188, 189, 192 mm). Two immature.

B6232 (formerly 287; 5/4). 4L+R tarsometatarsi (183, 187, 190, 196, 197 mm).

B6236 (formerly 285; 6/4). 2L+4R femurs (286, 289, 293, 296, 297, 307 mm).

B6238 (formerly 285; 2/1). 2L tibiotarsi (481, 512 mm).

Euryapteryx geranoides (Owen, 1848)

(81/12; minimum number of individuals based on 12L femurs or 12R tibiotarsi)

B6136 (formerly 422; 4/2). 2L+2R tibiotarsi (513 mm).

B6137 (formerly 422; 1/1). R femur (275 mm).

B6138 (formerly 415; 1/1). R tibiotarsus (400 mm).

B6139 (formerly 415; 1/1). R tibiotarsus (413 mm).

B6140 (formerly 416; 1/1). L femur (213 mm). Immature.

B6141 (formerly 416; 1/1). L femur (201 mm). Immature.

B6178 (formerly 441; 21/8). 8 crania; 4 premaxillas; 8 mandibles or mandibular fragments (minimum number of individuals = 4); quadrate.

B6229 (formerly 287; 4/3). 3L+R tibiotarsi (397, 414 mm).

B6230 (formerly 287; 7/5). 5L+2R femurs (242, 244, 244, 245, 263, 266 mm).

B6231 (formerly 287; 3/2). L+2R tarsometatarsi (186, 196 mm).

B6234 (formerly 285; 13/9). 4L+9R tarsometatarsi (187, 188, 211, 212, 212, 213, 214, 219, 219, 219, 221 mm). One immature.

B6235 (formerly 285; 11/6). 5L+6R femurs (285, 286, 289, 294, 302, 308, 309 mm).

B6237 (formerly 285; 13/7). 6L+7R tibiotarsi (466, 467, 479, 480, 493, 503, 510, 513, 514, 515, 531 mm).

Dinornis struthoides Owen, 1844

(22/5; minimum number of individuals based on 5L or 5R tarsometatarsi)

B6287 (formerly 285; 2/1). L+R femurs (306 mm).

B6288 (formerly 415; 1/1). R femur. Immature.

B6289 (formerly 416; 1/1). R femur (215 mm). Immature.

B6784 (formerly 413; 1/1). R tibiotarsus (594 mm).

B6785 (formerly 413; 1/1). R tibiotarsus.

B6791 (formerly 414; 7/4). 3L+4R tarsometatarsi (304, 309, 312, 314, 334 mm).

B6792 (formerly 414; 2/1). L+R tarsometatarsi (238 mm).

B6799 (former number not recorded; 1/1). R tibiotarsus.

B6800 (former number not recorded; 1/1). L tibiotarsus. Seems to make a pair with B6785.

B7062 (formerly 11; 4/1). Premaxilla; mandibular frgament; quadrate; uncinate process.

B11082 (formerly 416; 1/1). L tarsometatarsus. Immature.

Dinornis giganteus Owen, 1844

(2/1)

B6360 (formerly 432; 1/1). L femur. Damaged.

B11083 (formerly 441; 1/1). L proximal mandibular fragment.

Unidentified moas

(122/13)

B5677 (formerly 417; 5/3). 3R tibiotarsi (351 mm); L+R tarsometatarsi (160 mm). All immature.

B6179 (formerly Moa 18.15; 107/9). 4 sesamoids; 82 non-ungual phalanges; 21 ungual phalanges. Largest phalanx is 105 mm long.

B7128 (former number not recorded; 2/2). 2 sterna. Both large.

B7129 (former number not recorded; 4/4). 4 sterna. All large.

Fig. 4. Mrs Halcombe's moa egg (AIM B4016) in 1961, after its rescue from the house fire in New Plymouth. The egg is held by a neighbour. *Taranaki Herald* photograph (Taranaki Museum ARC2002–45).

B7130 (former number not recorded; 4/4). 4 sterna. Three large; one small.

AGE
The North Otago swamp sites are all undated but they are assumed to sample primarily Holocene faunas (Worthy 1998).

MOA EGG, B4016

Gill & Cooper (2001) described and illustrated a large fossil egg (approximately 208 mm long by 134 mm in diameter) that was broken but held together by sediment, and that seemed to be a moa's egg. When Ron Lambert of Taranaki Museum, New Plymouth, read the article he recognised the egg as having been in the collection of Mrs Blanche Stuart Halcombe (Fig. 4).

The egg and other items were bequeathed to Auckland Museum after Mrs Halcombe's death in a house-fire in 1961. Blanche Halcombe was a grand-daughter of William Swainson, the naturalist and illustrator, who emigrated to New Zealand from England in 1841.

Among the Halcombe papers at Taranaki Museum is a hand-written copy of a letter dated 27 May 1939 (ARC2002-58) to "Cousin John", presumably from Blanche Halcombe, which states "My brother got a moa's egg (dredged up at Cromwell)". This appears to establish a precise locality for the egg (Cromwell, Otago), and agrees with the prediction of an eastern South Island locality from petrographic analysis of the associated sediment (Gill & Cooper 2001). A letter from Halcombe (née Turton) to J.C. McLean dated 9 June 1911 (Auckland Museum Library MS181, Box 3, Folder 17) mentions the egg, establishing that it was collected sometime before 1912. The photo of the egg in 1961 (Fig. 4) shows it in the glazed case with green velvet lining in which it was stored at Auckland Museum until the 1980s.

DISCUSSION

The 280 bones, from a minimum of 19 moas, currently representing the Clevedon site in the Auckland Museum collection are far short of the 34 birds reported by the *N.Z. Herald* in 1912, or the 900 bones representing 40–50 birds reported by Oliver (1949: 14). Earlier reports may have been inaccurate, but it is more likely that after the finders' protracted attempts to sell the collection, Auckland Museum received only part of the original collection. Certainly the *Dinornis* skeleton (Fig. 1) is not among the Clevedon bones listed here.

Large numbers of *Anomalopteryx didiformis* at the Clevedon site, with fewer *Pachyornis mappini* and *Dinornis struthoides*, are evidence of a moa fauna typical of North Island wet forest sites (Worthy & Holdaway 2002: 193), the presence of tall podocarp forest being indicated by the numerous seeds of large forest trees. Likewise, the moa fauna at Kia Ora, dominated by *Emeus crassus* and *Euryapteryx geranoides*, is similar to that of other North Otago swamp sites (Worthy 1998: 471), and typical of lowland sites in the dry eastern South Island (Worthy & Holdaway 2002: 197).

Some Kia Ora bones are outside the size-range for the species they are assigned to, in terms of the sizes given by Worthy (1988) and Worthy & Holdaway (2002). For example, a tibiotarsus of *Pachyornis elephantopus* (B5940; 467 mm) is too small (published range 500–620 mm). However, some bones from latest Holocene sites extend these published size limits. For example, Worthy (1998: table 5) gave the size range of tibiotarsi of *P. elephantopus* from Otago as 425–606 mm, which accommodates B5940.

It is likely that several of the Kia Ora bones are misidentified. The femurs of *P. elephantopus* and *Eu. geranoides* are acknowledged to be difficult to distinguish (Worthy 1988: 13), as are the tibiotarsi of *Eu. geranoides* and *E. crassus* (Worthy 1988: 24–25). Preliminary DNA analysis of three femurs from Kia Ora assigned to *E. crassus* (B6106) suggests that two belong instead to *Eu. geranoides* (D. Lambert and L. Huynen, pers. comm. 2003), and high-lights the problem. I have removed these two bones from the sample in Table 1, but other bones are almost certainly misidentified, and the data should be regarded as approximate.

Acknowledgements. I thank C. Fforde for drawing my attention to the 1930 Warren correspondence in the Auckland Museum Library; R. Lambert (Taranaki Museum, New Plymouth) and J. Twist (National Museum of New Zealand, Wellington) for sending copies of relevant archive documents; D. Lambert, L. Huynen, A. Cooper and M. Bunce for information on DNA analyses of relevant bones; and T. Worthy and J. Grant-Mackie for helpful comments on a draft of this paper.

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A NEW SPECIES OF KIWI (AVES, APTERYGIFORMES) FROM OKARITO, NEW ZEALAND

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Abstract. The distinctiveness of the brown kiwi population at Okarito, West Coast, South Island, has been documented by morphological, parasitological, field, and genetic data in this and other studies. We formally describe and name this taxon as *Apteryx rowi*. This action aims to forestall use and repetition of recently-published *nomina nuda*, and also provides a valid scientific name for a critically endangered population.

KEYWORDS: *Apteryx rowi*; Apterygiformes; kiwi; Okarito; New Zealand; new species.

INTRODUCTION

At present, all brown kiwi populations from the South Island of New Zealand are taxonomically regarded as belonging either to one subspecies (*Apteryx australis australis* Shaw & Nodder, 1813, originally described from Dusky Sound, Fiordland) of the brown kiwi found throughout New Zealand (see Ornithological Society of New Zealand 1990: 8, Marchant & Higgins 1990: 71), or to a species (*Apteryx australis*) separate from North Island birds (*Apteryx mantelli* Bartlett, 1852) (see Holdaway *et al.* 2001: 125). However, the taxonomic status of the brown kiwi population living in the Okarito Forest – a small area of the West Coast of the South Island – has been a subject of debate for decades. Brian Reid and the late Colin Roderick (both of the former New Zealand Wildlife Service) claimed that the Okarito brown kiwi – known to them from the 1950s – was different from brown kiwi living in Fiordland (see O'Donnell & Dilks 1986: 26, Peat 1990: 100, Reid *et al.* 1995). The presence of a "special" kiwi was partly responsible for South Okarito forest being preserved in the 1970s and later added to the Westland National Park (Peat 1990: 100, Reid *et al.* 1995).

Preliminary genetic studies in the 1980s by David Fountain (Massey University, Palmerston North), and Charles Daugherty (Victoria University, Wellington), indicated that the Okarito brown kiwi was most closely related to the North Island brown kiwi (Powlesland 1988: 6–8, Peat 1990: 78, Butler & McLennan 1991: 20). Since about 1991, when the Kiwi Recovery Programme was formally established (Butler & McLennan 1991), the Okarito brown kiwi has been widely accepted as a separate taxon. For example, a painting of the taxon by Pauline Morse was included on *Bank of New Zealand* cheque books; it has been included as a separate taxon in lists of threatened plants and animals by the New Zealand Department of Conservation (Tisdall 1994, Hitchmough 2002); and, in 2000, it appeared in a New Zealand postage stamp issue of threatened birds painted by Paul Martinson (Anon. 2000). The identification of a species of

louse of the genus *Apterygon* Clay, 1960 (Insecta: Phthiraptera), exclusively parasitising Okarito brown kiwi, was another indication of the kiwi's uniqueness (Palma & Price, in press).

Recent molecular work has confirmed that the Okarito brown kiwi is different from its South Island congeners, and more closely related to North Island brown kiwi populations. Baker *et al.* (1995) published detailed data on the phylogenetic relationships of all kiwi taxa, including the Okarito brown kiwi, based on their analysis of allozymes and mitochondrial DNA sequences extracted from blood, as well as a summary of morphological and feather lice differences between all kiwi. Burbidge *et al.* (2003) presented similar results from an updated and more thorough analysis of mitochondrial DNA from brown kiwi.

Since the early 1990s Okarito brown kiwi have been referred to as "*Apteryx mantelli* subspecies", "*Apteryx mantelli* Okarito brown kiwi", "*Apteryx mantelli* Okarito", "*Apteryx mantelli 'Okarito'*", "*Apteryx* Okarito brown", *Apteryx* "Okarito", "Okarito brown kiwi", or "rowi" in various reports and popular accounts (e.g. Tisdall 1994, Anon. 2000, Blaikie 2000, Hitchmough 2002), and in Internet pages (e.g. *A Field Guide to the Birds on the Web* – September 2003 [http://fieldguide.tripod.com/struthio.html]).

The early vernacular names for brown kiwi at Okarito have a confused history. In 1867, Charles Douglas called the South Island brown kiwi (including those at Okarito and Haast) the "roa" (Pascoe 1957: 225, Langton 2000: 220). Although Langton (2000: 218) suggested that Douglas used "kiwi" to refer to the South Island brown kiwi, we agree with Pascoe's (1957: 225) conclusion that Douglas used the name "kiwi" for the little spotted kiwi (*Apteryx owenii* Gould, 1847). We believe that Hackett, in 1867, called the Okarito brown kiwi "rohi", despite Fleming's (1986) conclusion that "rohi" referred to the great spotted kiwi (*Apteryx haastii* Potts, 1872). Again, in our opinion, Hackett's "kiwi" was the little spotted kiwi, as opposed to Fleming's suggestion that it was the brown kiwi. Potts (1873) called the South Island brown kiwi the "rowi" and the little spotted kiwi the "kiwi". Potts's main informant and collector was Docherty. Docherty had killed about 2,200 "kiwi" and "rowi" by the end of 1871 and Potts had seen "hundreds of skins" of the rowi. Although Canterbury Museum once contained a "very great" number of skins and skeletons of the "rowi" (Potts 1873: 188), not one brown kiwi labelled as coming from Okarito in Potts's time, remains in its collection today (P. Scofield, *pers. comm.* 2003). Apparently, Potts (1873) was not certain that the brown kiwi occurred in the South Island outside the Okarito area. He was told that a "black kiwi" occurred further south, which he thought might be the "toko-weka" of Bruce Bay, and he immediately erected the taxon *Apteryx fusca* for it (Potts, 1873: 196), which we regard as a *nomen nudum*.

To summarise, the brown kiwi at Okarito have been called several different common names: "roa" by Douglas, "rohi" by Hackett, and "rowi" by Potts. Douglas's "roa" also referred to brown kiwi in other parts of the South Island. Potts's "rowi" referred to the South Island brown kiwi, except for the "black kiwi" at Bruce Bay. Additionally, Hamilton (1879) used "kiwi" and "rowi" as general names to encompass the kiwi species in the Okarito region, making particular reference to their occurrence in the alpine area, which is outside the current range of the Okarito brown kiwi.

Burbidge *et al.* (2003) used the scientific name "*A. rowii*", and Marsh (2003) used "*Apteryx rowii*", for the Okarito brown kiwi, thus inadvertently creating *nomina nuda*. Their articles lack two essential requirements for the proper naming of a new species under the rules of the International Commission on Zoological Nomenclature (1999): the explicit intention of establishing a new nominal taxon (*Code* Article 16.1) and the unequivocal designation of a holotype (*Code* Article 72.3.). The *nomen nudum* "*Apteryx rowii*" was also included in the Internet pages of *Bank of New Zealand Kiwi Recovery* [http://www.kiwirecovery.org.nz – September 2003].

Despite the uniqueness of the Okarito brown kiwi population and its ranking by the Department of Conservation as belonging to a "nationally critical" threatened species with the highest priority for conservation (Tisdall 1994: 26, Hitchmough 2002: 20), there is yet no formal published description naming it according to the rules of the International Commission on Zoological Nomenclature (1999). Therefore, considering the urgent need for a properly established scientific name for the Okarito brown kiwi, we herewith name and describe the new species. Another motivation for this taxonomic action is to forestall use and repetition of the *nomina nuda* mentioned above.

SYSTEMATICS

Order Apterygiformes
Family Apterygidae
Apteryx Shaw & Nodder, 1813

Apteryx rowi new species (Fig. 1)

A. rowii Burbidge *et al.*, 2003 [April]: 172, 176. *Nomen nudum.*
Apteryx rowii Marsh, 2003 [July]: 29. *Nomen nudum.*
VERNACULAR NAMES: Rowi, Okarito brown kiwi.
TYPE LOCALITY: South Okarito Forest, West Coast, South Island, New Zealand.

HOLOTYPE: Canterbury Museum AV38269, immature female mount (Fig. 1), trunk skeleton (dried), and internal organs (in 70% ethanol). Hatched shortly before 9 February 1999 in South Okarito Forest, banded (R-55376) as a juvenile on 21 September 1999, sexed using DNA, and named "Jammit". Never bred and was still living with her parents about a month before she was accidentally killed on Forks-Okarito Road, Okarito (43°15′S 173°13′E). Collected by the New Zealand Department of Conservation on 20 August 2002.

Her dried colours (Smithe 1974, 1975, 1981 numbers) are as follows. Body plumage: feather bases – centre of feathers black (82) with fuscous (21) edges; remainder of feather buff (24) centre with tawny (38) tip, edges black (82). Head plumage: centre of feathers fuscous (21) with buff (24) edges tipped with black (82). Head with small white feather areas, two white feathers below ear, white chin and upper neck. Plumage "soft" when stroked backwards. Outer wing feathers barred pale and darker. Longest facial bristles: 10 mm from the bill base. Bill: cream (54) with salmon (6) striations across surface near tip. Legs and feet pale: scales salmon (6) with some scale edges buff (24), claws reddish (apparently due to post-mortem bleeding). Measurements are given in Table 1.

PARATYPES: Very few specimens of *A. rowi* have been preserved. The paratype series includes all six specimens that we know of (besides the holotype), none of which are complete skins or skeletons. Measurements are given in Table 1.

(1) Canterbury Museum AV800, ?adult, sex unknown, headless partial pelt and partial skeleton (dried), road-killed at Big Swamp, Okarito, collected before 6 Nov. 1944 by A. Barrett.

(2) Museum of New Zealand Te Papa Tongarewa MNZ27239, juvenile male with testes 7 x 5 mm, partial skeleton (dried) and one leg in 70% ethanol, captured in Okarito Forest as a young chick on 3 October 2000, banded (R-57618) as a juvenile on Motuara Island on 8 January 2002; returned to South Okarito Forest on 30 January 2002, where found dead, possibly drowned, on 15 February 2002. Collected by C. Rickard, Department of Conservation.

Fig. 1. Holotype of *Apteryx rowi* new species (Canterbury Museum AV38269, immature female).

(3) MNZ27240, immature female (from dissection), partial skeleton (dried) and one leg and headless partial pelt in 70% ethanol, unbanded, died at Okarito Forest c. 8 March 2002. Thought to have drowned at least eight days before being collected by S. Anderson, Department of Conservation.

(4) MNZ27241, adult female (sexed from measurements of the living bird), headless partial pelt with one leg and partial skeleton (dried), banded (R-57626) on 7 May 2002 in South Okarito Forest but pelvis broken, apparently during capture. Died in veterinary care on 20 May 2002. Collected by S. Anderson, Department of Conservation.

(5) MNZ27242, immature female sexed using DNA, headless partial pelt with one leg and partial skeleton (dried) and mandible and one leg in 70% ethanol, named "Beep", from an egg laid in South Okarito Forest, hatched on 10 September 1999, taken to Motuara Island (Marlborough Sounds) on 24 February 2000 and banded (R-55382) on her return to Okarito on 6 December 2000. She died 5 m from a road in South Okarito Forest apparently as the result of a fight with another kiwi and was collected on 16 June 2002 by C. Rickard, Department of Conservation.

(6) MNZ27243, adult male (sexed from measurements of the living bird), headless partial pelt and partial skeleton (dried) and partial pelt and one leg in 70% ethanol, banded (R-34152) in Okarito Forest, on 10 February 1991; died, possibly as a result of intra-specific fighting, at Okarito in late July 2002. Collected by S. Anderson, Department of Conservation.

Table 1. Measurements of type specimens of *Apteryx rowi*. "Scute count" refers to large scutes on the dorsal surface of the tarsometatarsus. We defined large dorsal scutes as all those wide scutes from the juncture with the middle toe up the tarsus in a line until the size changes to half that of the previous scute. Measurements (mm) were taken from dead birds as follows: Bill = chord of bill length from tip to front edge of cere. Tarsus = chord of tarsometatarsus length from heel to distal joint with middle toe. Mid toe = middle toe + claw length from claw tip to toe joint with tarsometatarsus. Bristle % = length of longest facial bristles (when stretched out) from the front of the cere at the base of the bill, as a percentage of the total bill length. – = specimen too damaged to measure.

Registration number & age/sex	Scute count Left	Right	Bill	Tarsus	Mid toe	Bristle %	Weight (g)
CM AV38269* imm. female	7	7	120.7	84.0	58.2	8	1880
CM AV800 ?ad.	–	–	–	–	–	–	–
MNZ27239 juv. male	6	7	c.96	92	78.6	–	1650
MNZ27240 imm. female	5	8	105.5	98	78.1	–	2070
MNZ27241 ad. female	6	2	–	92	73.7	–	1970
MNZ27242 imm. female	8	6	c.125	94	85.3	42**	1960
MNZ27243 ad. male	–	8	90.3	93.2	75.9	–	2145
Mean	6.40	6.33					
s.d.	1.14	2.25					

* Holotype
** This is a minimum percentage based on throat bristles because all forehead and lores feathers were missing

DIAGNOSIS: A small "brown" kiwi that differs from other "brown" kiwi by the following combination of characters. Dorsal feathers largely brown, streaked lengthways. Plumage soft when stroked backwards. The head, neck and belly feathers are noticeably grey. The outer wing feathers are transversely barred pale and darker, with short barbless regions (quills) at the base of the shafts. About 60% of birds examined in the field have some white feathering (ranging from a single feather to solid patches) on the head, especially around the sides of the face. Facial bristles short. In live birds, the bills are normally pink (n = 11), the legs and feet are pink or pale brown (n = 12), with an average of 6–7 large dorsal tarsal scutes, and the claws are largely whitish (n = 8). Measurements of live birds are given in Table 2.

DISTRIBUTION: Okarito Forest, West Coast, South Island, New Zealand. A total population of 150–250 birds is restricted to 10,000 ha of coastal podocarp-hardwood forest between the Okarito River to the north and Waiho River to the south (Miller *et al.* 2001, Rickard 2002). The pre-human range of South Island "brown" kiwi taxa is unknown. Kiwi fossils are found throughout the South Island, including from within the large geographic gap between living populations of *A. rowi* and *A. mantelli*, but the specific identity of many of these bones is still to be determined (e.g. Worthy & Holdaway 1993, 1994; Holdaway *et al.* 2001).

ETYMOLOGY: The specific name *rowi* is a noun in apposition derived from one of the vernacular names of the new species. This name was selected at the request of the Ngai Tahu iwi.

Table 2. Measurements of live adult *Apteryx rowi* caught in the field by Department of Conservation staff. For methods used see Table 1.

	Mean	s.d.	n	Range
Weight (g)				
males	1924	157	49	1575–2250
females	2650	316	51	1950–3570
Bill length (mm)				
males	94.8	4.3	48	83.5–104.2
females	125.5	5.9	51	109.9–140.3

DISCUSSION

There is a dichotomy in kiwi plumages, with "brown" kiwi taxa having feathers streaked brown, grey and/or black lengthways, whereas "spotted" kiwi taxa have feathers that are greyish, transversely barred pale and darker (Marchant & Higgins 1990).

Szabo (1993: 7, 9) appears to be the first author to have published the distinctive features of the Okarito brown kiwi in detail. He wrote: "Surprisingly, the genetic break occurs at Okarito . . . not between the two islands. The three populations of brown kiwi found south of Okarito . . . turn out to be genetically distinct from the Okarito and North Island brown kiwis." . . . "The Okarito population has a greyer plumage and white head markings around the eye and eyebrows, whereas the Haast birds . . . are of a reddish hue and the Fiordland population are brownish-grey. . . . Okarito birds share the physical characteristics of the southern species but are genetically closer to the North Island species . . .".

The plumage, bill, legs and claws of *A. rowi* are generally paler than in other "brown" kiwi taxa. However, the Okarito birds share most of their morphological and behavioural features with South Island brown kiwi (*A. a. australis*) and Stewart Island brown kiwi (*A. a. lawryi*), especially plumage softness, short facial bristles, shared incubation and living in family groups (Burbidge *et al.* 2003). The white feathering on the head of *A. rowi* is sometimes seen in other taxa of "brown" kiwi (authors' unpublished data), but the greyness of the head and neck plumage of *A. rowi* appears to distinguish it from the other taxa. The feathers of *A. rowi* are soft when stroked backwards, unlike those of *A. mantelli* which have a protruding rachis at the feather-tip (see Marchant & Higgins 1990). Barred outer wing feathers are found in *A. rowi* but not in other "brown" kiwi taxa. The short barbless regions at the wing feather bases are unlike the elongate ones in *A. mantelli* but similar to those of *A. australis* (see Bartlett 1852).

Bill colours of other "brown" kiwi are sometimes pinkish as in live *A. rowi*, but *A. mantelli* and *A. a. australis* often have pale cream- or horn-coloured bills and *A. a. lawryi* may have a slate-grey bill (Marchant & Higgins 1990). The bill of dried *A. rowi* specimens is sometimes cream-coloured. *Apteryx mantelli* and *A. a. australis* often have darker legs than the pink or pale brown legs of *A. rowi*, while *A. a. lawryi* has bluish grey legs (Marchant & Higgins 1990). The claws of other "brown" kiwi taxa are often much darker than the whitish claws of *A. rowi* (see Marchant & Higgins 1990).

Okarito brown kiwi have the shortest bills of any "brown" kiwi taxa. Bill lengths of *A. rowi* have a smaller mean and lower range than in *A. mantelli*, *A. a. australis* and *A. a. lawryi* (Tables 1, 2; Marchant & Higgins 1990: 79). Weights of "brown" kiwi are highly variable and *A. rowi* overlaps considerably with *A. mantelli* and *A. a. australis*. However, adult *A. rowi* are lighter than adult *A. a. lawryi* (see Tables 1, 2; Marchant & Higgins 1990: 79–80).

The count of large scutes on the dorsal surface of the tarsometatarsus of *A. rowi* is similar to that of *A. a. australis*, slightly less than that of *A. mantelli* and slightly more than that of *A. a. lawryi* (Tables 1, 3). Greater numbers of large scutes in "brown" kiwi taxa are not a result of a longer tarsus, as *A. rowi* and *A. mantelli* have shorter tarsi on average than *A. a. lawryi* (Table 1, Marchant & Higgins 1990). However, the number of scutes varies considerably within taxa, and even between left and right legs of the same individuals (see Table 1). The difference in scute pattern between taxa is not on the scale reported by some other researchers. Bartlett (1852) figured the tarsus scutes of *A. australis* and *A. mantelli* but neither illustration is typical of the specimens that we have examined. Using our criteria (see definition in Table 1), Bartlett's *A. australis* would have zero large scutes and his *A. mantelli* would have three scutes – both counts are below the normal number of large scutes that we found on these taxa (see Table 3). Baker *et al.* (1995) and Burbidge *et al.* (2003) reported that *A. mantelli* had 17 large tarsal scutes, a figure well above our range (4–12, Table 3), but their figures for scute counts of *A. rowi* (7) and *A. australis* (4–6) are similar to ours (see Tables 1 & 3).

Bartlett (1852) pointed out that *A. mantelli* had longer facial bristles than *A. australis* and this is borne out by our measurements, which also suggest that *A. a. lawryi* may have shorter

Table 3. Scute counts and measurements of facial bristle length (mm) in kiwi specimens held by Museum of New Zealand Te Papa Tongarewa (MONZ) – *Apteryx mantelli* (dried skins, 5 ad. male, 5 ad. female: MONZ 13550, 15376, 15382, 15647, 15775, 15777, 15778, 15820, 15821, 18168); *A. australis australis* (dried skins, all adult-sized birds: MONZ 2067, 2068, 18736, 11871, 22089, 27238); *A. australis lawryi* (dried skins/mounts, all adult-sized birds: MONZ 16610, 17105, 20994, 23718). For methods used see Table 1. Scute counts were taken from one leg of each specimen.

	Mean	s.d.	n	Range
Apteryx mantelli				
Scute count	9.0	2.5	10	4–12
Bristle length (sexes combined)	60	14	10	33–72
Bristle length (males)	66	9.9	5	49–72
Bristle length (females)	55	16.2	5	33–72
Apteryx australis australis				
Scute count	5.8	2.3	6	2–8
Bristle length	32	8	5	21–42
Apteryx australis lawryi				
Scute count	4.5	1.3	4	3–6
Bristle length	20	4.8	4	14–25

bristles than *A. a. australis* (see Table 3). Baker *et al.* (1995) and Burbidge *et al.* (2003) considered *A. rowi* to have "short" facial bristles. Our two facial bristle length measurements for *A. rowi* (8% and at least 42% of bill length, Table 1) suggest that this taxon has variable bristle lengths but that generally these may be shorter than the bristles of *A. mantelli*. The preliminary inter-taxa differences detected here are worth more detailed study.

According to studies of mitochondrial DNA and allozymes, *A. rowi* is the sister taxon of *A. mantelli* (Baker et al. 1995, Burbidge et al. 2003). This closer relationship to *A. mantelli* than to *A. australis* is also supported by evidence from the lice recorded from these kiwi species, in particular the species of the genus *Apterygon* Clay, 1960 (Palma & Price, in press).

In conclusion we recognise the following brown kiwi taxa:
Apteryx australis australis Shaw and Nodder, 1813: South-west South Island.
Apteryx australis lawryi Rothschild, 1893: Stewart Island.
Apteryx mantelli Bartlett, 1852: North Island.
Apteryx rowi new species: Okarito, South Island.

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